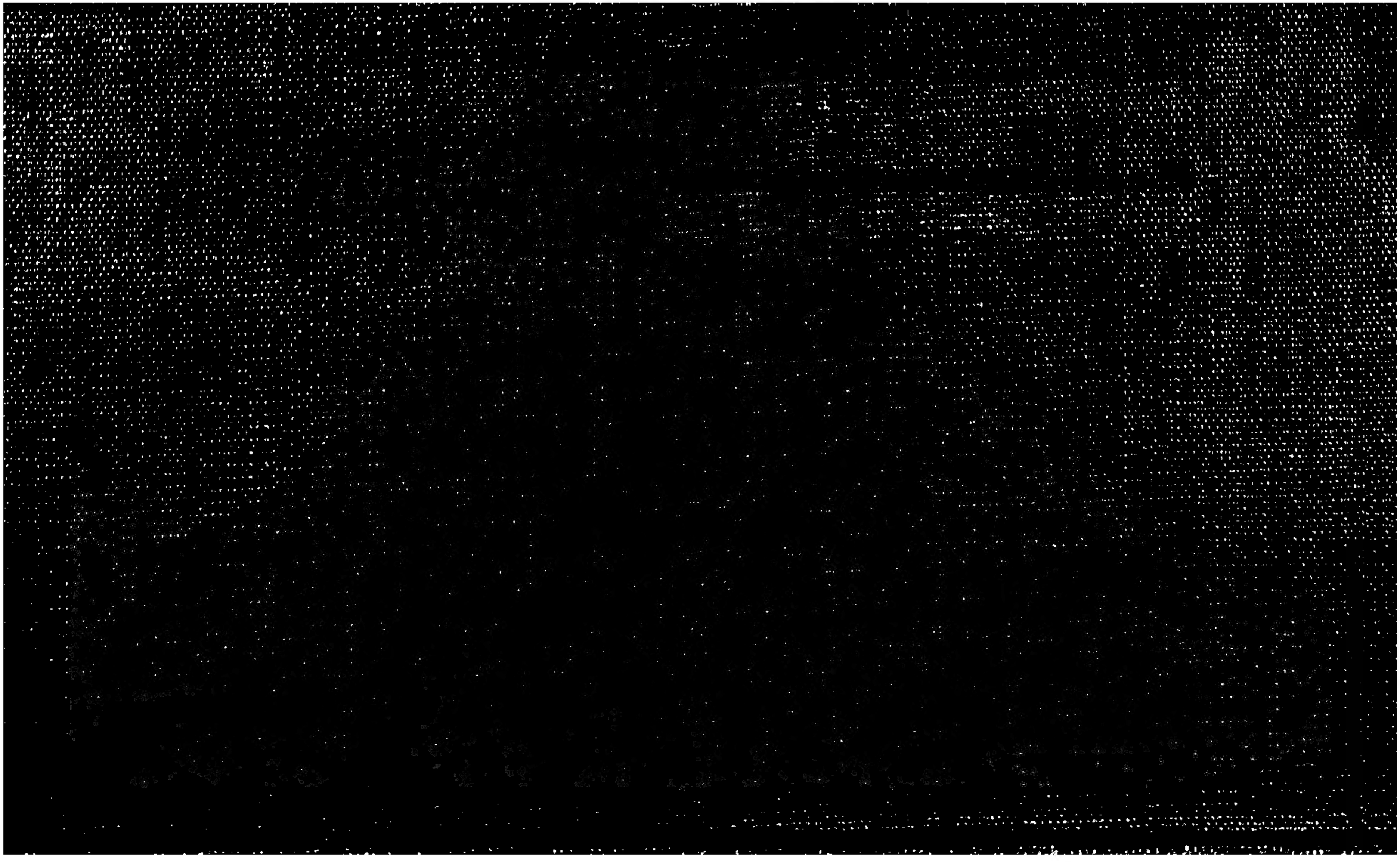

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CAROL H. WOODWARD
EDITOR

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CAROL H. WOODWARD, Editor

LATE WINTER EVENTS AT THE GARDEN

Museum Exhibits

Open daily, 10 a.m. to 5 p.m.

Members' Day Program

3:30 p.m. in the Members' Room

Feb. 5—*Dr. Hosack and the Elgin Botanical Garden* — *Clarence McK. Lewis*

Afternoon Courses

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15 consecutive Wednesdays, 4-6 p.m. — $5 ($2 to teachers)

Mar. 1—*Plant Propagation* — *E. E. Naylor*, Instructor

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Saturday Afternoon Programs

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Jan. 18—*Landing and Living in the Tropics* — *R. A. Howard*

Jan. 25—*Gardens of the Sea* — *I. G. C. Cooper*

Feb. 8—*Protective Devices in the Insect World* — *Louis Pyenson*

Feb. 15—*Wild Flowers and Other Bits of Nature* — *Samuel H. Gottscho*

Feb. 22—*Forest Treasures and Doorway to Happiness*—
Two motion pictures

Radio Programs

Alternate Wednesdays at 5:45 p.m. over WNYC (830 on the dial)

Jan. 22—*Plant Tumors and Cancer in Animals* — *Robert S. de Ropp*

Feb. 5—*How to Keep Your House Plants Healthy* — *Chris G. Schmitt*

Feb. 19—*Mid-winter Use of the Small Greenhouse* — *Ernest Chabot*

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The Botanical Garden at Nikko

By B. C. Blackburn

ENTERING through a grey stone gateway and passing a small gatekeeper's lodge, one continues along a beautiful avenue of cherry trees meeting overhead and casting cool shadow patterns over a nicely kept gravel driveway. Conifers and rhododendrons press in closely behind the cherries, adding to the atmosphere of quiet and seclusion. The drive leads to a circle before a rambling Japanese house, and immediately in front one sees the alpine garden and the laboratory building framed in conifers and overlooking an alpine meadow, misted blue in early spring with *Houstonia*. Radiating and extending from this central picture are the walks and roadways of a modern botanical garden, through forest glades, across sparkling brooks, around sunny hillsides, and along the threatening Daiya River. Here is one of the most enchanting and beautiful gardens of the world today.

Nikko has long been a mecca for nature lovers, as well as Buddhist and Shinto worshippers, for the unique avenues of giant cryptomerias, planted by a feudal lord to honor the Tokugawas in the 17th century, are now as breathtaking and as magnificent as the elaborate temple buildings themselves. The impressive setting of towering mountains makes a superb background for naturalistic plantings, and alpine plants thrive in the cool, moist climate.

The history of the Nikko Botanical Garden begins somewhat prior to 1902, the year when four men prominent in diverse fields, and all originally from the city of Mito in Ibaraki Prefecture, northeast of Tokyo, put into execution plans to start a new botanical garden in which the many beautiful alpine plants of the Japanese islands could be grown and studied. The original idea seems to have come from Dr. Jinzo Matsumura, the first director of Tokyo Imperial University's historic garden in Koishikawa at the former Hakusan Palace in Tokyo. The project received hearty support from Dr. Matsumura's friends and fellow natives of Mito, Bunya

Ioki, an artist who drew alpine plants, and Kazuma Jyō, a lawyer who was an alpine enthusiast. Shinchō Nakayama, chief priest of the Tōsyō Shrine at Nikko at that time, assisted in the deliberations of the three plantsmen, and it was decided that Nikko, on the eastern slope of Mount Hutara in Tochigi Prefecture, a little over 80 miles northwest of Tokyo, would be ideal for the garden's location. Another native of Mito, Naoyoshi Mochidzuki, was selected as the new garden's first director.

The original garden was started at Nikko under the auspices of the priests of the Tōsyō Shrine, along the east side of the temple grounds at a spot known as Hotoke-iwa, beside the Inari or Fox River, a branch stream of the Daiya.

In 1908 the garden was taken over by Tokyo Imperial University's Faculty of Science and removed to its present location above the "new village" of Nikko, following plans laid out by Dr. Tamura, professor of landscape architecture at the University. This site comprises 21 acres of gently sloping and hilly ground extending down to the Daiya River from the highway to Lake Chuzenji. The Nikko garden is organized and administered as a branch of the Koishikawa garden of the Imperial University, and its plantings are designed to compliment those of the older garden in Tokyo. Following the original concept of the founders, it is primarily for growing plants of the Japanese islands which do not thrive in the lower altitude of Tokyo, where temperature and humidity are considerably higher.

Dr. Yoshiharu Matsumura, formerly at Kyoto Imperial University, is the third and present director of the garden, and Dr. Honda, director of the parent garden at Koishikawa, gives the Nikko garden regular supervision. Dr. Matsumura is particularly interested in alpines, and during my visits in the spring of 1946 he was developing plans to elaborate and extend the present alpine garden, particularly in making separate gardens for the rock plants of Hokkaido and for alpines of the main islands. Impressive proof of the soundness and economy of the naturalistic design for the garden, as well as the excellence of the administration, is at once evident in the complete recovery from inevitable wartime neglect. Paths are well maintained and all areas are immaculate, and labeling is amazingly completely and meticulously done. It may be added, for American readers, that there are no weeds anywhere—but in Japan one encounters weeds only in rare and unusual circumstances.

The principal buildings at the Garden are an office, a frame building in western style in which the director has a laboratory, and a very attractive house used as the director's residence and on occasion as a dormitory for visitors. This building, in traditional Japanese style, was formerly the Nikko villa of Count Matsudaira of Kagawa, and from its three front rooms and outside corridor or porch one looks directly into the rock

From the Director's residence, one sees this view in the Nikko Botanical Garden.

garden—in fact, one feels actually *in* the rock garden. Miniature peaks rise on either side, dramatically framed with conifers and set with beautiful stonework and choice Japanese alpine plants. Beyond opens a vista of sweeping lawn, framed by extensions of the deciduous woodland which makes a belt along the Daiya River and on the other bank reaches to the coniferous forest of the mountains. Across the river, on the narrow opposite bank, sit mossy, time-softened stone images of Jizō, Buddhist protector of children and travelers. Some of these placid seated figures have been swept away when the turbulent Daiya undermined its bank and tore out part of the mountainside, but a strong wall protects the remaining statues and insures the serenity of their contemplation. Tradition has it

that one is never able to count the number of statues quite accurately, but there seem to be nearly 70 seated along the edge of the ancient pathway.

Behind the Jizō statues, and towering high above the little river, the rugged mountains to the south make a dramatic backdrop for a man-made garden. Rising majestically from the depths of a rocky valley filled with coniferous forest, Nakimushi Mountain dominates this dramatic picture, now flooded with sunlight, and now partly concealed by mists and clouds.

The alpine meadow in the Nikko Botanical Garden, brocaded in spring with bluets (Houstonia). In the background, rugged mountains rise, dominated by the peak of Nakimushiyama.

On my first visit to the garden, in mid-April of 1946, the lawn beyond the rock garden was a brocade meadow of bluets, with azaleas making delicate splashes of color at the edges. A group of children had slipped in to play, and when I greeted those nearest me with "Konnichi wa!", they paused in their game and politely answered, "Herro!" and "Good morning!"—in the amusing wire-crossing of languages that so often brings one with limited Japanese language ability to a bewildered pause after such a casual conversation. . . . Again, in early May, the cherry trees along the avenue were at their best, with a few pink petals drifting downward in the light breeze, and at the end of the drive waves of soft

color of Kaempfer azaleas with sunlight splashing through them. What a setting for a garden, and for gardeners!

The rock garden seemed carpeted with many unfamiliar and exciting plants, and many which I knew only from written descriptions. A stream from one of the miniature mountains gushed over a rocky course and into an alpine lake, and at lower levels slipped placidly into small ponds. Hurrying streams and restful ponds seemed everywhere, and a site with more interesting possibilities for making water gardens and finding the proper settings for all types of plants cannot be imagined.

Starting from the office or laboratory building, paths skirt the rolling lawn and make a network through the garden. The most recently developed portion is a beautiful hill and glade overlooking a small lake and the canyon of the river from a spot favored by the Emperor Taisho, who spent much time at the Imperial Villa adjacent to the botanical garden. At the top of this hill, just outside the high wall of the villa, is a chestnut-tree on which the Emperor would hang his hat while he rested, and a few yards away, in a sunlit glade beyond a little grove of beeches, the Empress would gather new shoots of WARABI, bracken-fern*, for the cooks.

The vicinity of the slope crowned by the "hat-hanging chestnut" is named the Emperor Taisho Memorial Garden, developed from a plan by Dr. Tamura in 1927. In addition to the chestnut (*Castanea crenata*) and beeches (*Fagus crenata*), other plants featured are a dwarf table-shaped form of *Prunus Sargentii*, magnificent prostrate junipers (*Juniperus conferta*), Nikko azaleas (*Rhododendron nikoense*), blueberries, stewartias, and ferns.

One of the most fascinating plant associations is the section which may be called the bog garden. Hurrying down from the mountain summits above the Tōsyō Shrine, a small stream slips under the highway and into the grounds of the garden, dashes through a grove of azaleas and cypresses and tumbles over a miniature precipice. Beside the waterwall, in a matrix rich with mosses and lichens, *Tanakaea radicans* makes a green mosaic with its beautiful pale salver-shaped leaves and misty white flowers. The stream scrambles on over mossy stones and divides into several channels, where its windings become leisurely, and in the rich areas between, many bog plants are growing luxuriantly—osmundas and other very handsome ferns, primulas, cypripediums, polygonatums, smila-

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* Dr. Matsumura had his little son gather shoots of WARABI (*Pteridium latiusculum* var. *japonicum*) from this spot, and Mrs. Matsumura had them prepared for our dinner. I commend this delicacy heartily, and this use may suggest justification for American gardeners resigned to enduring bits of bracken we can never quite eradicate from collected azaleas and laurels in our gardens. The American form of this pan-temperate fern would taste just as good, surely. The newest shoot-tips are placed in boiling water for a few seconds and then flavored to one's taste. Eaten with hashi, chopsticks, they are truly delicious. . . . Another tidbit enjoyed at the Matsumuras' table was a dish of KISUGE, daylily flowers, lightly boiled for a minute or two and flavored with a sprinkling of salt. They are sweetish, slightly fragrant, and very delicate.

Yoshiharu Matsumura, Director, with his small son at the Nikko Botanical Garden. The historic "hat-hanging chestnut" stands at the top of the slope above the prostrate junipers.

cinas, azaleas, even skunk-cabbages, as we know them, and also the Nipponese version in *Lysichitum camtschatcense*. On three sides, the bog is framed by conifers and a native shrub grouping of spireas, deutzias, hydrangeas, barberries, and more azaleas. On the fourth side, prostrate junipers and greensward climb to the "hat-hanging chestnut."

In this Nikko garden, the diverse forms of Japanese plants, as we have come to know them in America, are not as evident (fortunately, perhaps) as we have been led to anticipate. To consider one or two examples:

At the garden I did not see any "amoena" or Hinodegiri azaleas, nor any others with blooms comparable to these in impact. Japanese yews are also conspicuous by their scarcity, after a fashion of speaking, though I finally noted two specimens decorously screening a water-closet set off on one of the back paths. Looking for the superabundance of retinospora varieties found in American nurseries, I noticed scarcely more than two or three. The Japanese prefer the native Hinoki and Sawara cypresses to all the elaborated forms of these two types.

Evergreen rhododendrons are few at the Nikko garden, aside from the plants along the drive at the entrance; Dr. Matsumura says they do not grow particularly well. He pointed out that Nikko is dry and sunny in winter, while in summer it is cool, cloudy, and rainy. It therefore seems possible that the evergreen types do not ripen sufficiently in summer and early autumn. Winter temperatures and snowfall in the Nikko area are not markedly different from those in the New York City-Long Island area, but humidity and summer temperatures are very dissimilar.

Among the plants on which I took particular notes, the following—many fairly well known in the United States—appear to be of special interest for American gardens, though a great many more might well be added to this meager list. The scientific names and references follow those used at the Nikko Botanical Garden and by the Tokyo Imperial University. For verifying my hurriedly scribbled notes and for furnishing the historical data on the founding of the Garden I am deeply indebted to Dr. Matsumura, and to all the Matsumura family for their very delightful hospitality.

PLANTS OF SPECIAL INTEREST IN THE NIKKO BOTANICAL GARDEN

Abelia sanguinea Makino. BENIBANA-TSUKUBANE-UTSUGI in Japanese; a graceful, delicately branched shrub coming into full bloom on May 12, with pink corollas expanding from angular brown buds. Like other wild species of *Abelia,* this can hardly be compared with our familiar hybrid, *A. grandiflora,* on all points of general garden value.

Abies homolepis Siebold and Zuccarini. Indigenous trees of this high-mountain fir were not noted at the botanical garden, but young plants are making fine growth. URAJIRO-MOMI in Japanese, this conifer which grows so well in the eastern states is known to us as the Nikko fir.

Acer nikoense Maximowicz. This interesting trifoliate maple seems to grow no differently in its native locality than around Boston and New York City, and not as well as in Brooklyn!

Adiantum pedatum Linnaeus. This universal favorite is native in the Nikko area. Its Japanese name, KUJAKUSHIDA, means "peacock-fern," and seems much more fitting than its transcendental English name of maidenhair.

Athyrium yokoscense Christensen. HEBINONEGOZA, meaning "snail sleeping-mat;" a very dainty fern growing luxuriantly among rocks in moist shade.

Bistorta vulgaris Hill. Not a rare plant, perhaps, but it was very pleasing beside the central path in the alpine garden, and in late May its pale pink spikes were waving gracefully on their 18-inch stems and serving as mooring-masts for delicate white butterflies, which hovered around the blooms all day.

Carpinus laxiflora Blume. A sturdy and handsome small tree with grey-mottled bark. The largest specimen noted was about 21 feet high and had a trunk diameter of 10 inches. Its Japanese name is AKA-SHIDE. appropriately meaning "red hornbeam."

Cercidiphyllum japonicum Siebold and Zuccarini. KATSURA. Graceful young specimens of this beautiful tree showed the slender, one-trunk habit we

associate more particularly with the Chinese variety, and none exhibited the cluster-trunked growth with which we are more familiar in America.

Chionographis japonica Maximowicz. An attractive alpine of the Melanthaceae, with graceful white flowers reminding one of a small swamp-pink (*Helonias*), and very effective among the mossy stones in the alpine garden. SHIRAITO-SO, the Japanese name, means "white-string-grass."

Clethra barbinervis Siebold and Zuccarini. This plant, known as RYOBU in Japanese, was awarded a gold ribbon, along with *Rodgersia podophylla,* in my mental review of all the plants noted in the Nikko garden, and my thoughts linger with satisfaction and anticipation on the half-dozen I planted a few years ago. The largest specimen of this *Clethra* at the Nikko garden is a superb small tree about 18 feet in height, with three trunks showing the pale new bark, blue-grey in color, overlaid with the older bark in moleskin-colored patches. This effect is fully as beautiful as the bark picture of *Acer griseum*, and the Japanese *Clethra* has the added beauty of bright red petioles holding the large leaves. Its creamy white flowers in summer are in the best *Clethra* tradition, though perhaps not so fragrant as our American summersweet.

Cynoxylon japonicum F. Maekawa—but with all respect to Dr. Maekawa at the Tokyo Imperial University, who first opened my eyes to the beautiful Tokyo botanical reprints, I like to think of this noteworthy dogwood as *Cornus kousa.* Quite oblivious to the rules of botanical nomenclature, Japanese countrymen know the little tree as YAMABOSHI, "mountain-hat," which is very sensible indeed. The trees at the Nikko garden were growing crowded in deciduous woodland, a natural environment, though none was so fine as many on Long Island and in northern New Jersey. (Some of these, however, may be the Chinese variety.)

Cypripedium japonicum Thunberg. A striking group of this species of moccasin-flower was growing lushly in cool shade under conifers, and their large flowers, deep ruddy-red in the main, presented a very dramatic picture. This was matched by the pale green leaves which were pleated like the divisions of a caryota palm.

Davallia Mariesii Moore. The climbing rootstocks of this graceful hare's-foot fern, SHINOBU in Japanese, pressed themselves over boulders and up tree trunks. Its leaves have furnished Japanese lacquer artists with very beautiful designs.

Enkianthus campanulatus Nichols or ***Tritomodon campanulatum*** F. Maekawa. This distinctive shrub reaches a height of about 10 feet at Nikko, just as we see it at its best also at the Arnold Arboretum. The Japanese know it as SARASA-DODAN.

Epimedium macranthum Morren and Decaisne. One of the large barrenworts, with leaves presenting handsome coppery and reddish tones, making spectacular pictures in rock crevices and as a ground-cover under shrubs. It should be used widely in our gardens.

Euonymus alatus Siebold. Appropriately called NISHIKIGI, "brocade-tree," by the gardeners and nurserymen of Japan.

Euonymus Fortunei radicans Rehder. TSURUMASAKI, "vine-euonymus." This evergreen creeper seems to grow with more refinement in its native land than with us. It made a beautiful study on the trunk of a twisted Toringo crab-apple near the bank above the Daiya River.

Filipendula purpurea Maximowicz. Bold clumps promised fine displays in the sunny portion of the bog garden.

Hemerocallis esculenta Koidzumi. A rich orange-flowered daylily, dwarfish in habit. This species is native of the area and it is called NIKKO-KISUGE, meaning Nikko daylily. It is the one whose ready-to-open buds we ate with delicate restraint.

Hosta glauca Stearn. A handsome and effective plant, with darkish blue-green leaves.

Hosta Sieboldiana Engler. More American gardens should certainly enjoy the dramatic beauties of this sturdy plantain-lily. In Nikko it grows identically as with us, and it seems particularly effective at the edge of shrub and conifer plantings.

* * *

Hydrangea petiolaris Siebold and Zuccarini, var. ***ovalifolia*** Franchet and Savatier. A very attractive vine, as we know full well of the type. It grows wild in the rocky woodlands around the shrines at Nikko, where it is known as TSURU-AJISAI.

Larix Kaempferi Sargent. RAKU-YOSHO, "leaf-dropping pine." Some authorities insist this is the best larch for us to plant in America.

Lepisorus Onoei Ching. A creeping epiphytic fern that establishes itself on moist and shaded surfaces in Japanese mountain areas. The people know it as HIMENOKISHINOBU, which may be translated as "small under-eaves fern." I also noted it growing 30 feet up on the trunks of hornbeam maples, in the forest on the lower slopes of Mount Hutara, above the shrines.

Osmunda lancea Thunberg. A handsome and sturdy fern luxuriating in the bog garden, where it reached a height of two and one-half feet. It is similar to our royal fern.

Polygonatum falcatum A. Gray. NARUKO-YURI "scarecrow-lily." Another vigorous denizen of the rock garden, and in full bloom in mid-June, with pale yellow elongated bells.

Pinus pumila Regel. HAIMATSU of Japanese gardeners, or "creeping pine." A sturdy mounded little tree with prostrate stems.

Primula japonica A. Gray. These primroses, KURIN-SO to the Japanese were finishing their top tiers of bloom in early June. The plantings of this species were not large, nor was it featured in other gardens visited, and it appears that these superb plants may be appreciated more in the States than in their homeland.

Rhododendron japonicum Suringar and ***R. Kaempferi*** Planchon. Plantings of these lovely azaleas made masses 10 feet high along the entrance driveway and were in full bloom on May 12. The former has reddish-orange flowers which are poisonous to eat, the latter scarlet; both are native over most of the Japanese islands.

Rhododendron lateritium Planchon. Very delicate and large-flowering evergreen azaleas known as SATSUKI, "May-blooming azalea," to the Japanese. Their similarity to the variety we know as "G. F. Wilson" is marked.

Rhododendron nikoense Nakai. A striking, beautifully branched shrub called AKAYASHIO, "red azalea," by the Japanese. Generally similar to *R. pentaphyllum*, in delicacy of flower it also resembles *R. Schlippenbachii*. Despite the Japanese name, the flowers are a very fine pink;

About the Author

Before joining the Armed Forces of the United States in 1942, Mr. Blackburn was Assistant Professor of Ornamental Horticulture at the New Jersey State College of Agriculture. He lectured extensively and contributed articles on woody plants to the *Flower Grower* and other magazines, even after his Army service began. He is also the author of a small book on gardening, "Your Garden This Week," published by the Rutgers University Press in 1939. After a period of service with the Army in this country, working especially on camouflage, Mr. Blackburn was sent to New Guinea, the Philippines and Japan, where he served as a Captain in public welfare and education assignments in the Eighth Army Military Government Section. He returned to this country last summer and was mustered out of service in July. He is now undertaking studies for a Ph.D. degree at Rutgers University.

the word AKA covers the entire gamut of reds in Japanese. In late April and May this beautiful shrub comes into bloom in the Nikko mountains, and colors entire peaks with its delicate tone. Nakimushiyama is held to be particularly beautiful by the Japanese when it is in this "red" stage of spring development.

Rhododendron quinquefolium Bisset and Moore. An upright shrub of the same delicate framework as *R. nikoense*, which it seems to resemble very strongly in general characters. The extreme crowding of leaves to make what appear as five-leaved whorls is very striking in this species; its broad-campanulate white flowers are at their best in Nikko in late April and early May.

Rhododendron Tschonoskii Maximowicz, forma ***pentamerum*** Makino. KOMETSUTSUJI, "rice azalea," is the well-chosen vernacular name of this neat rounded shrub growing about four feet high. The small, ivory-white or grey-white flowers open over several weeks in mid and late spring, and the color and shape of the segments, resembling rice grains, make the Japanese name most appropriate. It is an interesting shrub, but not showy.

Rodgersia podophylla A. Gray. The flowers of this woodland ground-cover are large delicate plumes like those of the heartiest astilbes, but even greater beauty lies in the striking wheel-like leaves. Its growth-habit is like that of our familiar May-apple, but the *Rodgersia* grows somewhat larger and is five times as exciting. In Japanese it is called YAGURUMASO, "arrow-wheel herb," as an arrow-wheel in Nippon is a type of wind-wheel made with feathers, and the leaf divisions of this plant suggest just this.

Rosa microphylla Roxburgh, var. ***hirtula*** Regel. A beautiful 12-foot tree, covered in early June with three-inch single blooms in pale pink. Despite the simplicity of single flowers and small foliage, this rose makes an exotic picture because of its unusual size and very interesting habit. The vernacular name, SANSHO-BARA, is based on the strong resemblance of the leaves to those of *Zanthoxylum*.

Schizandra nigra Maximowicz. MATSUBUSA or USHI-BUDO, "cow-grape." An interesting vine, seen climbing to the top of a 25-foot Sargent cherry. The fruits are used as food and also to color SAKE, Japanese wine.

Spiraea nipponica Maximowicz. This graceful shrub fitted very well into the naturalistic setting around the bog garden, bringing one more bit of evidence to bear against my mistaken idea that oriental spireas are intrinsically sophisticated shrubs for dressed-up situations only. (Similar misconceptions about deutzias and hydrangeas, among others, are now corrected also.)

Styrax japonica Siebold and Zuccarini. As is also true of the Japanese dogwood, this small tree seems to grow more sparsely in its native land.

Styrax Obassia Siebold and Zuccarini. Several fine specimens of this choice tree were noted in shaded and moist spots, associated with HINOKI and other conifers. Its local name is OBA-ASAGARA, meaning "large-leaved asagara," and indicates the rather casual derivation of the scientific name for the species. It is also called HAKUUN-BOKU, "white-cloud-tree," from its appearance in flower.

Styrax Shiraiana Makino. KO-HAKUUN-BOKU, "small white-cloud-tree," grows about 20 feet high and has white flowers in May.

Thuja Standishii Carrière. Young specimens, about 18 feet in height, were making very fine growth. The foliage of this species has a grace and beauty quite distinct from other arborvitae, and as it grows equally well for us, it should find more general use in our gardens.

Thujopsis dolobrata Siebold and Zuccarini. Though more characteristic of southern Honshu and rarely native in the Nikko mountains, this conifer reaches a height of 30 feet in the botanical garden and produces handsome trees quite unlike the straggly specimens we manage indifferently in the New York area. It seems advisable to provide it with light shade and protection from sweeping winds, furnished by adjacent evergreens and deciduous trees, perhaps. Its Japanese name is ASUNARO, which is translated as "grow-tomorrow." According to an old story, when reproached for not growing as large and as stout as HINOKI (*Chamaecyparis obtusa* Endlicher), the Jap-

anese timber of such great value which is used for the finest lacquer work and most important buildings, the little tree appeared sadly conscious of its shortcomings. Then it said calmly, "Never mind; I will grow tomorrow."

Tripetaleia paniculata Siebold and Zuccarini. An interesting, rather coarse, seven-foot shrub, called HO-TSUTSUJI, "panicle-flowered azalea."

Tsuga diversifolia Masters. The rather formal hemlock which takes well to growing conditions in eastern America. The shape of the delicate leaves suggests the Japanese common name, KOMETSUGA, "rice hemlock."

Vaccinium Oldhami Miquel. NATSUHAZE, "summer-berry." Finding this blueberry in the Nikko garden was an unexpected meeting with an old friend, as it were, from the Bussey Hill section of the Arnold Arboretum. This is a very handsome shrub on all counts—habit of growth, flowers, fruits, autumn coloration.

Vaccinium Usunoki Nakai. An interesting blueberry of medium height, suitable as woodland cover.

Viburnum dilatatum Thunberg, forma ***pilosulum*** Nakai. GAMAZUMI. More loose in habit and less formal than *Viburnum dilatatum* as we know it. The shrub was in full bloom at the end of May.

Woodwardia radicans var. ***orientalis*** Swartz. This viviparous chain-fern is more graceful than our species and accepts more diversified locations, as it grows happily in dry stone crevices. The Japanese call it KOMOCHISHIDA, "children-having fern."

Some Remarks on the Nutrition of Plants

By Herbert A. Lunt

Connecticut Agricultural Experiment Station

OAK trees and goldenrod, flowering dogwood and Canada thistle, alfalfa and lettuce, pumpkins and sweet-william—all are built of the same basic materials: minerals, nitrogen, water, oxygen, and carbon dioxide. Within the seed lie the genes which determine into what sort of an organism these raw materials will develop. Each species of plant is characterized by certain morphological features which distinguish it from all other species. Likewise there are differences between species in their physiological functions and growth habits, and, hence, in their nutritional requirements. In some, these differences are highly distinctive and generally well known, while in others they are so slight as to be indistinguishable even to the trained plant physiologist. It is fortunate, indeed, that many plants of economic importance have rather similar nutrient requirements; otherwise the task of the farmer, the florist, and the nurseryman—and not excluding the agronomist and the fertilizer dealer—would be immensely more difficult than it is.

That plants do differ in their nutritional requirements is no longer questioned, but there was a time when the opposite view was held by many

people. Only a little over a century ago Liebig, in his discussion of chemistry as it applied to agriculture and physiology, maintained that the percentage nutrient content of plants is constant, and, therefore, the nutrient composition represents their nutrient needs. This theory has been thoroughly disproved by researches carried on since Liebig's time. We now know that the composition of a plant is affected by the nutrient supply, but it is also affected to an equal or greater degree by other factors. What these factors are and how they operate will become apparent later in the discussion.

As a starting point let us consider the amounts of plant nutrients in some common farm and orchard crops—figures readily obtained by chemical analysis of representative samples, and calculated on the basis of acre yield. This has been done on numerous occasions and the findings reported in the literature. Such data are distressingly variable, however, owing to differences in climate, in soil, in variety or strain, and in maturity of the plants at the time of sampling. Nevertheless, sufficient data taken under rather comparable conditions have been obtained to give a rough idea of the amount of the major plant nutrients contained in the crop. These data have been compiled from various sources by the fertilizer industry and are presented in the accompanying table. The data for forest trees have been added by the writer.

For convenience, the crops have been divided into three groups based on the total amount of nitrogen, phosphoric acid, and potash ($N + P_2O_5 + K_2O$) in the crop; first, those crops containing less than 150 pounds per acre; second, those with 150 to 250 pounds; and third, those more than 250 pounds. In most instances these figures refer to the amount in the crop as harvested, and do not include the unused portions such as the leaves of fruit trees, the vines of potatoes and tomatoes, etc.

The reader will observe that certain plants, notably the cereals, forest trees, most of the legumes, and spinach, consume more nitrogen than either phosphoric acid or potash. Others, such as oranges, sweet potatoes, tobacco, celery, potatoes, sugar beets, and tomatoes, use more potash. Celery and tomatoes are particularly outstanding in this respect. Phosphorus, on the other hand, is required in relatively small amounts by all crops. The grains contain a higher proportion of phosphorus to nitrogen and potash than other crops, but in no case does phosphorus equal either nitrogen or potassium. This fact is of considerable significance inasmuch as most fertilizers contain more phosphorus than potassium—often two or three times as much. Unfortunately, comparable data are not available for the other essential nutrients.

Sources of Plant Nutrients

As a second step toward the understanding of nutritional problems, let us discuss briefly the sources of plant nutrients.

AMOUNT OF NUTRIENTS IN CERTAIN CROPS

Crop	*Yield per acre*	*Nitrogen* (N) *pounds*	*Phosphoric acid* (P_2O_5) *pounds*	*Potash* (K_2O) *pounds*	*Total*
Apples	400 bushels	30	10	35	75
Barley	40 bushels	50	20	40	110
Oats	50 bushels	50	20	45	115
Timothy	1.5 tons	40	15	45	100
Wheat	30 bushels	50	20	30	100
Woodland		15	3	6	24
Average		37	14	34	87
Cabbage	15 tons	100	25	100	225
Corn	60 bushels	95	35	70	200
Cowpeas	2 tons	125	25	90	240
Lespedeza	3 tons	130	30	70	230
Oranges	600 boxes	90	30	130	250
Pea beans	30 bushels	95	30	55	180
Peaches	500 bushels	85	25	100	210
Peanuts	1 ton	85	15	50	150
Red Clover	2 tons	80	20	70	170
Soybeans	25 bushels	125	40	60	225
Spinach	1000 bushels	90	30	45	165
Sweet potatoes	300 bushels	75	20	115	210
Tobacco	1500 pounds	80	20	115	215
Average		97	27	82	205
Alfalfa	3 tons	140	35	135	310
Celery	350 crates	80	65	235	380
Potatoes	300 bushels	125	35	170	330
Sugar beets	15 tons	115	45	145	305
Sweet clover	5 tons	185	45	165	395
Tomatoes	10 tons	100	35	200	335
Average		124	43	175	343

Nitrogen. By far the largest part of soil nitrogen is in unavailable form as organic matter and humus in various stages of decomposition. Only when it is broken down by soil micro-organisms to ammonia, and especially to nitrates, can it be used by plants. Generally speaking, the production of nitrates from soil organic matter is not equal to the needs of rapidly growing crops, hence manure, compost, or commercial fertilizer must be added. Nitrogen is especially needed for spinach, lettuce, cabbage, and other leafy crops, particularly on sandy soils low in organic matter. The common observation that dark soils are fertile soils is true, generally speaking, because the dark color is usually due to the presence of organic matter which is the potential source of nitrogen. Soils well supplied with organic matter possess other desirable qualities also, which need not be elaborated upon here.

Legumes ordinarily do not need an outside source of nitrogen, for they are able to obtain sufficient amounts from the air by means of symbiotic fixation, when properly inoculated.

Slower growing shrubs and forest trees usually get enough nitrogen from the naturally decomposing organic matter, plus what might be added in rain and that fixed by non-symbiotic organisms, both of which sources provide but small amounts. Sometimes, however, conditions are unfavorable for decomposition of the litter and it remains inactive, with the result that the trees suffer from nitrogen deficiency. Disturbing the litter and mixing it with the mineral soil, opening the stand so as to admit more light and heat, or the application of nitrogenous fertilizers are ways of overcoming such a condition.

Phosphorus. The discrepancy between the amount of phosphorus consumed by the crop and the amount that has to be applied prompted Lawes and Gilbert, in 1851, to conclude that the nutrient composition of the crop "is no *direct* guide whatever" to fertilizer needs. This discrepancy is due to two factors:—(1) soils usually contain but small amounts of phosphorus, and the rate of availability is slow, and (2) when available phosphorus is applied to the soil, part of it is reverted to a less soluble form, and part becomes fixed, that is, chemically combined in the soil and thus made unavailable. The latter process is particularly in evidence in acid soils (usually pH 5 or lower) where phosphorus combines with iron and aluminum to form the insoluble iron and aluminum phosphates. Raising the pH by the use of lime precipitates these metals and causes the formation of the more soluble calcium phosphates.

Soils vary widely in their phosphorus-fixing power, those high in clay being the worst offenders. On the average, about 75 percent of the phosphorus applied becomes fixed. Thus, to meet the needs of fast-growing crops, disproportionately large amounts must be applied. Continued high rates of application will eventually build up the available phosphorus supply to the point where only light amounts are required annually to produce adequate yields. This has happened in the tobacco fields of the Connecticut valley.

Potassium. Potassium silicate is one of the common constituents of rock. When rock is weathered to clay and silt, this weathered material contains potassium in several forms:—(1) a very small amount of water-soluble potash readily available to plants and subject to loss by leaching; (2) a considerably larger amount chemically combined within the clay particles, and generally available to plants but firmly held against leaching; and (3) the insoluble silicate form, constituting probably 90 per cent of the total, unavailable to plants except through the slow process of weathering.

Sandy soils are low in potash because they contain but little clay. Muck soils are notoriously low for the same reason. Plants that grow slowly are usually able to obtain sufficient potash without the need of artificial treatment. When potash fertilizer is applied, some fixation takes place but the proportion so tied up is considerably less than with phosphorus.

Calcium and magnesium. The requirements of plants for calcium and magnesium are not shown in the table, but these elements are of such importance they should be discussed, if only briefly. Soils adequately limed exhibit no shortage of calcium but they may be deficient in magnesium unless dolomitic limestone is used occasionally. Lack of calcium is a definite factor in the poor results obtained on acid soils. There are cases, such as in potato growing, where a fair degree of acidity is desired, yet there must not be a deficiency of calcium. Here calcium sulfate (gypsum) can be used, for it has little or no effect on the acidity of the soil.

Other elements. The requirements of plants for sulfur, manganese, boron, zinc, copper, molybdenum, iron, silica, cobalt, and probably others are low and are usually adequately met by the soil. Many cases of deficiency have been reported, however, and more are likely to develop with the continually increasing crop yields, and the greater use of synthetic fertilizers with a higher degree of purity than natural salts. Sulfur applications have given tremendous increases in the yields of alfalfa and other legumes in certain parts of the West. Manganese and molybdenum may be usually low in some soils, while in others they may be in ample quantity but held in unavailable form—mainly in soils with a pH above 6.5 and high in organic matter content. The same may be said for boron, its availability being dependent upon the proportion of boron to calcium, magnesium, and potassium and also upon the ratio of any one of these three bases to the other two. Weather conditions likewise affect the situation, boron deficiency symptoms showing up much more readily in seasons of dry weather than when the rainfall is normal.

Copper is often lacking in peat and other highly organic soils, and occasionally in sands.

Zinc deficiency symptoms take the form of "little-leaf" disease of peach and other deciduous fruits, of "mottle-leaf" in citrus fruits, and of "rosette" disease in pecans. These nutritional troubles occur in California, Arizona, and Florida, and in many other parts of the world. Zinc becomes unavailable with increasing pH. A deficiency in acid soils is probably due to crop removal, to the lessened use of organic fertilizers, and to the substitution of cover crops in place of the native covers.

Iron can be made unavailable by the use of too much lime, as has already been mentioned. Cobalt deficiency, found in New Hampshire and in Australia, is a nutritional disease of livestock. It does not seem to affect the growth of the plant.

Plant Cafeteria

That plants are selective in what they take up has been demonstrated many times. Growing side by side on the same soil, dogwood leaves may

contain twice as much calcium and potassium as red maple leaves, and nearly four times as much calcium as beech. Alfalfa has a calcium content of about 1.5 percent, and requires a nearly neutral soil (pH 6.4 or higher) containing an abundance of calcium. It would never survive on our neglected pasture and brush fields where the soil is strongly acid (pH 4.5) and low in fertility. Yet red cedar grows well on such soils and its foliage has a calcium content of three percent. White pine on the same soil will show only about one percent in its needles.

One of the most striking examples of selective absorption is the case of selenium in parts of Wyoming and adjoining states. On soils containing considerable amounts of selenium, wheat plants will contain only three or four p.p.m. (parts per million), with a possible maximum of 30 p.p.m. Alfalfa and vetch will average six to eight p.p.m., and cabbage 25 to 35. But native plants average about 800, with a maximum of around 15,000 p.p.m. Selenium, by the way, is the only known element taken up by plants in sufficient amounts to be lethal to animals, but it is not toxic to plants. Probably selenium is essential to plants but in infinitesimal amounts.

The absorption of larger quantities of a nutrient than are actually needed is referred to as luxury feeding—a common condition in the plant world. Potassium in particular, among the more common essential elements, is taken up freely if available in the soil in large quantities. A chemical analysis of a luxury feeder, therefore, gives no clue as to the requirements of that plant for the nutrients in question. Such an analysis, however, if sufficiently complete and if studied in relation to all factors involved, will provide a great deal of information in regard to the nutritive status of the plant.

Much depends upon the balance between the various elements. The dependence of boron availability upon the ratio between that element and the other bases has already been mentioned. An excess of lime may be just as harmful as too little lime, for it depresses the absorption of other bases. A plant showing potash starvation may be suffering just as much from calcium toxicity. Too much potassium keeps the plant from getting enough calcium, magnesium, and boron. It has been found, for example, that tomatoes became chloritic where the available potash content of the soil was high. Tests showed a deficiency of magnesium in the foliage. Since magnesium is a necessary constituent of chlorophyll, chlorosis resulted. Under certain conditions an application of nitrogen to the soil may accentuate copper deficiency. Many other examples could be cited.

In some situations, a certain minimum level is necessary to insure satisfactory quality for livestock feeding or for human food, which level may be in excess of that required for maximum, or at least economic,

yields. Agronomists and plant physiologists are now aware of the nutritional angle and have as their goal the increase in quality as well as quantity.

Time and Rate of Absorption

Analysis of plants at different stages of growth show the rate of absorption of the several nutrients during the progress of the season. Obviously small plants cannot possibly draw as heavily upon the soil as large ones. For example, nine days after setting out, tobacco plants require less than a pound of potash per acre; at 24 days, they require 11 pounds; at 39 days, 108 pounds; 54 days, 180 pounds, and 61 days, 190 pounds. During the first 50 days, potatoes have been found to require a total of only seven pounds of nitrogen, and 14 of potash. But during the following 10 days they required a pound of nitrogen and two pounds of potash *per day;* and in the next 20 days—that is, 60 to 80 days after planting—the requirement was two and four pounds *per day* respectively. This shows the necessity of having plant food become available in ample quantities when the plants need it, hence the importance of delayed availability and of the use of side dressings on certain crops, particularly during periods of heavy rainfall when losses by leaching are apt to occur.

The situation with regard to perennials is somewhat different, inasmuch as the roots remain in the ground the year around and a certain amount of absorption takes place more or less continuously, except when the ground is frozen. Plant nutrients can be stored at one period and utilized at another. With trees, growth in any one year is dependent to no small extent upon the moisture, temperature and nutrient supply of the preceding year.

Also, there are periods of maximum and minimum absorption of different nutrients, as has been determined by European investigators many years ago. These studies showed that phosphorus absorption takes place in pine during August and September; in spruce from late May through September; and in silver fir from March through July. The comparable dates for potash are: pine, June-September; spruce, May-July; and silver fir, February-May. There is need for further research along this line.

An Unlimited Field

Obviously this article has merely scratched the surface of the known information about plant nutrition. The mechanics of nutrient absorption and assimilation in water or sand cultures is complicated enough; in soil it is infinitely more so. We have come a long way from Liebig and from Lawes and Gilbert in our understanding of nutritional problems and in the techniques used in their solution. But there is still much to learn. The field of plant nutrition is practically unlimited. No one can predict what new developments will arise to revolutionize agriculture.

BROADCAST

By Helen S. Hull

When Mrs. Lewis M. Hull moved into a new home at Boonton, New Jersey, about ten years ago, she found a spot in the front yard so overgrown with weeds and shrubbery that her husband dubbed it "the scar." This would never do, she thought, so with her gardener's instinct and experience, she cleared the area of undesirable material, exposed a magnificent gray rock, and transformed the spot, by planting of columbine, Dutchmen's breeches, and other wild flowers and ferns, into a woodland garden which today is a place of great beauty.

Since that first year in the new home, the extension of the woodland garden has been one of Mrs. Hull's favorite pastimes. So successful has she been in making wild flowers of the region grow naturally around her house, that the New York Botanical Garden asked her to appear on the radio program over WNYC October 30 to tell others what they could do toward planning a woodland garden.

Mrs. Hull's suggestions are given here.

Planning a Woodland Garden for Next Spring

FIRST of all, select a site near the house where you can enjoy the unfolding of the furry buds on the first hepaticas, watch daily as the bloodroot pushes its way through the clasping leaves, and see the Dutchmen's breeches swaying like pantaloons drying on a line in the April breeze. Of course, if you have a woodland at a distance you can't move it, but it sometimes pays to create the effect of one close to the house. After years of expecting my family and friends to share my enthusiasm enough to don goloshes and brave the March winds and April showers in a sloppy trek to see my treasures, I have given up. Now my woodland garden begins ten feet from our front steps, with some of my favorite plants tucked in around an outcropping of rock underneath a black oak tree.

If there is a natural woodland situation near the house, then your problem of having a woodland garden is so simple that you need no suggestions from me. All that is necessary is to remove the undesirable brush, cut paths where they seem needed, and introduce colonies of plants in any way your sense of garden design would direct. You would, of course, find out what kinds of plants belong naturally in your kind of woodland, and you would not try to grow plants that belong in a sunny meadow in the deep shade of oak trees.

It is a fairly simple matter to bring plants in from the wild and establish them in your garden. The whole secret of success lies in your care in creating for them a new home which closely resembles the one they inhabit in nature. And in moving them to a new home, always bring a generous spadeful of earth around their roots.

Just remember that our early woodland flowers are set in their ways, and it is little use to expect success with them unless we conform to their demands. The best way to meet their requirements, of course, is to take note of the situation in which you find them in the wild. For example, early-blooming plants which disappear in the summer need heavy overhead shade during their long dormant period. You can create a desirable situation for your plants if you first will visualize their natural habitat.

The soil is very important, and it does not pay to try to compromise with the wrong soil. If it is not a natural woodland situation, it is better to dig out the soil to a depth of a foot—eight inches at the very least—and replace it with soil from the woods. If this is unobtainable, I use what I call a "forest mixture" composed of 1/3 topsoil garden loam, 1/3 leafmold, and the rest peatmoss and sand. If I have no leafmold, then garden loam with a generous amount of peatmoss and a dash of sand will do, with peatmoss added as a top layer for a moisture-holding mulch. Woods soil is

light and crumbly, rich in humus, and it holds water like a sponge. After the soil is prepared I often cover the place with pine needles and let the spot remain a whole season before planting, allowing the soil to settle and ripen. I use pine needles because they are an excellent mulch, they do not blow or mat, they let moisture through, and also because I think they are a nice brown color and always smell like Christmas.

Ferns for Initial Planting

Autumn is a good time to start planning and planting a woodland garden, but the end of October is a little later than I like to set out most plants. However, if one is anxious to start a garden of this sort in the fall, a quick effect can be obtained by setting out ferns and some of the smaller plants, leaving the taller ones and any shrubs and trees you may want until a later date. If I were planting in late October, I would order these smaller woodland plants, such as bloodroot, hepatica, and others, from a nursery in Maine or Vermont, rather than the south where the spring buds would be further advanced.

When I first began planting the garden in front of my house, I used the big gray rock that I had exposed as a background for evergreen and nearly evergreen ferns —the Christmas fern, the evergreen woodfern, ebony spleenwort, common polypody. By tucking these into the crevices in the rock, which were already partly filled with black leafmold, the result of many years of oak leaves falling from overhead, I was able to transform the "scar" into a spot of beauty in a day. I planted the ferns in drifts and they soon looked as though they had always been growing there. Flowers were not added until late spring and summer, whenever I could get young plants or seeds. But I had my plans made long ahead of time. I broadcast wild columbine seeds over the rock crevices, and now their rosettes of fern-like foliage and pink stems in spring seem to complement the ferns and the rock, and when the red bells shimmer in the mid-April breeze, the old scar is a lovely sight. These two kinds of plants are enough for beauty, but I have added others. Dutchmen's breeches have taken over the bank beyond the rock—they do like an eastern bank if they are to spread from seed. Large white trillium, which started out as a clump of 25, last spring produced 72 blooms at one time. Yellow lady-slippers do very well in the drier soil at the top of the ledge, there is a Jack-in-the-pulpit here and there, and violets spring up everywhere and would take over the place if I let them.

I never use any fertilizer in my woodland garden. If trees are overhead, there will be an annual fall of leaves—a natural winter covering to enrich the soil with leafmold, and no artificial fertilizer is ever needed. I have found it wise to keep the leaves off, however, until a good hard freeze, in order to discourage mice, moles and chipmunks from adopting my garden for their winter quarters, using my choice plants for their winter food supply. So I have an oakleaf path along the base of the ledge, where I pile the leaves which fall early in the season. By spring this pile has been soaked down, and now after years of accumulation the path is a treasure house of leafmold. By scratching down through the top layer of leaves, I have all the leafmold I need for this and other woodland plantings. Besides this, it makes a very nice leafy path to walk on.

Summary of Hints

To sum up the suggestions for the planning and planting of a woodland garden, I would say:

1. Select a site for your woodland garden which is close enough to the house, so you can enjoy each bursting bud in early spring.
2. Restrict yourself to those plants for which you are prepared by your conditions of soil, light, and moisture. Brookside plants and those of a sunny meadow are lovely, but not in a woodland garden.
3. Prepare a home similar to the one from which the plants will have come.
4. Don't compromise with the soil. Start right, with woodland soil, light, moisture-holding, rich with humus.
5. Transplant each specimen with a large spade of earth.
6. Best of all, get to know the habits of your plants, and they will always be a source of joy and wonder and will enrich your life.

The above script was published with the aid of the Caroline and Olivia Phelps Stokes fund for the preservation of wild flowers.

NOTICES AND REVIEWS OF RECENT BOOKS

Human Adjustments in Agriculture

THE FARMER'S LAST FRONTIER. Fred A. Shannon. Volume V, The Economic History of the United States, 414 pages, illustrated. Farrar & Rinehart, New York, 1945. $5.

Professor Shannon has contributed perhaps the most comprehensive and most readable account which we now have of the history of American agriculture during the forty years which followed the Civil War. His book is Volume V in a series of nine which bids fair to be the most integrated and authoritative full-length treatment of America's economic history yet projected. At a time when the United States has emerged as the world's foremost economic power it is of tremendous importance both to the ordinary citizen as well as to the student that we have available such a sound and full treatment of our economic life.

"The Farmer's Last Frontier" deals with that important period when the frontier was closing and the agricultural people were adjusting to this fact. The author is deeply aware of the changes which were taking place among farmers and indeed in the whole society as we turned from a predominantly agrarian to a predominantly industrial people. The approach in his book is from the farmer's point of view and is concerned with the reactions of farm people to both restricted migration and the necessity to substitute conservation methods and a newer husbandry for the older exploitative ways.

Never before . . . so many beautiful

NEW FLOWERS

Many new plants developed during the war are now ready to make 1947 a truly interesting garden year. A few of these choice items:

NEW ROSES—*Butterscotch:* Soft buff-yellow outside; inside pale buff, penciled lightly with orange-buff. ***Edith Willkie:*** Pointed bud jasper red. Inside shrimp pink. Both Hill creations.

NEW CALIFORNIA ROSE ORIGINATIONS—exclusive Wayside introductions. ***Glorius:*** Vermillion buds, semi-double flowers of Tyrian rose. ***White Wings:*** Dogwood-like flowers, gold-tipped amethyst stamens. ***Ming Toy:*** A dainty red cluster rose. Quite like a miniature Camellia.

NEW CHRYSANTHEMUM WHITE CACTUS—Pointed petals form fully double flower like a Cactus Dahlia. Blooms 4" to 6".

NEW HARDY PHLOX—*Pinkette:* Large florets delicate pink; tubes to plant deep pink. ***Rosy-Blue:*** Soft lavender blue with delicate pink undertones. Hardy. Large flower heads.

SEND FOR WORLD'S FINEST HORTICULTURAL BOOK-CATALOG. 176 pages. Hundreds of lovely flowers in true colors. Complete cultural instructions to grow finest roses, shrubs, plants and bulbs. To be sure you get this outstanding book, it is necessary that you enclose with your request 50c, coin or stamps, to cover postage and handling costs.

Wayside Gardens

51 Mentor Avenue Mentor, Ohio

The book is not on the technical advances in agriculture though the period which is covered is one of great technical development. It is a book about people. Here is its chief value and its chief interest. The author is quite apparently interested in discovering the forces which have made American farm people what they are. Certainly he shows that the economic life of farmers is linked with the economic life of the whole nation, that instability in the national economy brings about an equal instability in the agricultural economy. In this sense there is no separate farm problem. Individualism as a characteristic of farmers is discussed and the extent to which farmers seem capable of co-operative action is brought out in a fine treatment of the rural co-operative movement. Here he shows plainly by example that the predominant economic characteristics of the whole society have been determining factors in the life of farmers. To Professor Shannon farmers have never really gone far enough to outbalance the effect of other influences. So long, for instance, as industrial workers were poorly paid, the savings which farmers made through co-operation on their marketing and buying costs was never enough to insure security.

In reading this book one is impressed both by its scholarship and its simplicity of style. The author has included at the end a very full summary of the literature on the subject covered by the book, and this should prove valuable to all students of the period. Likewise, the volume is well illustrated so that the historical narrative comes further alive; and graphs and charts are used with sufficient care so as not to burden the text.

This series of economic studies, and Professor Shannon's contribution to it, are no duplication of what has been already done in the field of American economic life. There is, of course, a wealth of material available. What these books intend to do, however, is to bring together in an authoritative fashion and with a fresh and lively approach our existing and available knowledge. In a very real sense this story of American farm people at the end of the last century fulfills this aim.

P. Alston Waring,
New Hope, Pa.

For Florida's Nature Lovers

THE NATIVE TREES OF FLORIDA. Erdman West & Lillian E. Arnold. XX + 212 pages: key, illustrations, index, references. University of Florida .Press, Gainesville, 1946. $3.75, clothbound; $3. paperbound.

This is one of the two books on trees which have long been wanted by the "nature lovers of Florida," to whom it is dedicated.

Each of 202 pages is devoted to a species or variety; or, occasionally, to two or three related species: about 271 in all. The nomenclature follows the rules of the International Code. Important synonyms and some common names are added. On each page are clear, accurate, line drawings of flowers, fruits, and a twig with leaves; most of them made by Robert K. Turner under the direction of the authors, who are botanists of the Florida Agricultural Experiment Station. The accompanying text consists of a brief, but adequate, description; a summary of distinguishing characters; a general comment on distribution, habitat, economic importance,

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etc.; and a comparison of related species. These notes show the extensive field studies made by Mr. West and Miss Arnold and give valuable recognition marks.

A simple key in couplet form serves to locate the genus, or at least the family, to which each tree belongs, and should go far toward overcoming the amateur botanist's instinctive fear of such a device. However, I note a little oversimplification: for example, in connection with *Piscidia, Bursera,* and *Celastraceae* in the key; and with the omission from the key of lines referring to *Picrammia pentandra, Cornus alternifolia, Zanthoxylum coriaceum,* and *Vaccinium arboreum.* I wonder, also, about the reasons for omitting from the book such species as *Leitneria floridana, Morus rubra, Hypelate trifoliata, Bumelia lycioides, Enallagma cucurbitina,* and *Psychotria bahamensis.*

"The Native Trees of Florida" contains very few typographical or other errors and presents a pleasing appearance. Altogether it is a most satisfactory book. Since its selection of species is strictly that of its title, it should be followed by a similar work on the 300 or so naturalized and exotic trees of the state. Much material along this line has already been published by Director Harold Mowry and colleagues of the same Experiment Station; but in bulletins now for the most part out of print.

MARY F. BARRETT.

A Text to Extend Botanical Horizons

BOTANY — PRINCIPLES AND PROBLEMS. Edmund W. Sinnott. 696 pages. illustrated, indexed. McGraw-Hill Book Co., New York, 1946. $4.50.

Happily, books are written, not born. And how fortunate that botanical textbooks can begin to record some of the recent important advances in science as their own; botany, too, can have its epoch making discoveries.

Penicillin and the new synthetic phytohormone popularly called "2-4-D" are probably among the most significant biological discoveries of all time. Their botanical origins may soon be forgotten, but their contribution to the well being of man has only begun. These and a number of other advances of the past decade have found their way into the new edition of Edmund W. Sinnott's "Botany; Principles and Problems." One also finds such physiological topics as tissue culture, hydroponics, the use of tagged atoms, vitamins and plant physiology, colchicine and polyploidy, and evidence of the numerous practical uses of plant hormones. Not always are they discussed extensively, but it is significant that they have been included in an elementary textbook.

Every teacher of botany should read Chapter V on "Botany and the Future" before teaching another class. In the words of the author, "Botany needs more skilled interpreters to describe its advances to the reading world;" this chapter is essentially one on scope and perspective. It will help extend the horizons and shape the thinking of every teacher who is interested in better interpretation of his science. Between its lines one feels the warm challenge, if any textbook can be warm, that calls for making theoretical advances ultimately apply to the basic problems of man. For too long teachers of botany have been content to teach the facts of

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plant structure, classification, and "life cycles," (important though they may be), and close their eyes to the new vistas that might lead out of the rut of traditional subject matter. Dr. Sinnott's book still deals with the traditional, but there are refreshing interludes where one feels that he can have new *ideas* and that they are at least as important as previously established facts.

The author's background in the classics is reflected in an appendix of Greek and Latin roots used in the construction of a number of botanical terms. Thoughtful students will find it both interesting and helpful.

GEORGE S. AVERY, JR.,
Brooklyn Botanic Garden.

Life of a Forest Giant

BIG TREE. Mary and Conrad Buff. 80 pages, illustrated in duotone. The Viking Press. New York, 1946. $3.

This book gives a vivid but restrained portrayal of the trials and tribulations of a Big Tree, "Wawona," from seed to seedling, sapling, and the giant tree of the forest. Natural history of animals in the mountain forest is interwoven with the life history of the tree.

Action is provided by a battle of two bucks, happenings in and about a golden eagles' eyrie, the flight of the animals before an oncoming forest fire, and finally the operations of the lumbermen. California is not mentioned.

Although written primarily for children, it makes good reading for anyone interested in the inhabitants of the forest. The book is attractively illustrated, and printed in clear type.

W. C. MUENSCHER,
Cornell University.

Some British Mushrooms

POISONOUS FUNGI. John Ramsbottom. 32 pages, illustrated in color. Penguin Books, New York, 1945. $1.

A competent British authority buries sound advice on poisonous mushrooms in long paragraphs about their history, superstitions, classical beliefs, and popular illusions. Yet this slender book can render a great service if only the reader discovers this sentence: "To know whether a species is edible or poisonous

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it is necessary to be able to recognize it and to learn its reputation."

To recognize poisonous species the American reader then turns to 16 vivid color plates—and runs into confusion. The deadly *Amanita phalloides* is shown to be deep green on top. Ours is white or has a tawny tinge. The fly amanita is shown to be vermilion red. Ours is ordinarily bright orange or yellow. This is the difference between the British amanitas and our American forms. Out of twenty additional species illustrated, only eleven are common in America.

Specific names of some also add to the confusion. Finally five of the mushrooms illustrated are admitted in their descriptions to be not poisonous, even edible!

RUTHERFORD PLATT.

Notes, News, and Comment

Honor. Dr. B. O. Dodge was elected an honorary member of the British Mycological Society at the Fiftieth Anniversary Jubilee Meeting in London in October.

Plants and Cancer. At the Conference on Nutrition in Relation to Cancer, which took place at the American Museum of Natural History Dec. 6 and 7, Dr. William J. Robbins spoke on "Some Basic Contributions to the Cancer Problem, from the Study of Plants." The conference was sponsored jointly by the New York Academy of Sciences and the Panel on Nutrition, Committee on Growth, of the National Research Council.

Back to Hawaii. Otto Degener, who has been pursuing his research on the flora of Hawaii at the New York Botanical Garden since the beginning of the war, returned by clipper to his home in Honolulu Dec. 24.

Conference. Members of the scientific staff and registered students of the Garden were addressed at the monthly conference Dec. 11 by Dr. Robert S. de Ropp, Assistant Curator, on "The growth and behavior of crown-gall tumor tissue; its possible bearing on the problem of cancer."

Science Fair. Dr. E. E. Naylor served as one of the judges at the School Science Fair promoted by the American Institute of the City of New York at Madison Square Garden on the opening day, Dec. 7.

Lecture. The first in a series of "survival" lessons was given by G. L. Wittrock Nov. 27 to a group of Boy Scouts in a lecture on the edible wild plants of the New York area.

H. Beaman Douglass

WHILE spending his customary winter in Florida, at West Palm Beach, Dr. H. Beaman Douglass of New York died Dec. 5 at the age of 81. Dr. Douglass had long been a member of the New York Botanical Garden, and for many years he contributed an original lecture annually to the Saturday afternoon series. Among the topics he presented, beginning in 1931, were: "Some Edible and Poisonous Mushrooms from Maine," "Jungles and Gardens in Florida," "Palms of Florida," "The First Families of Florida and their Crops," "Trees by the Roadside," "Showy Flowers of Florida," "Some Seaweeds and their Companions," and "Plants—Their Struggle to Survive."

Dr. Douglass was also a member of the Torrey Botanical Club, and in 1917 and '18 he contributed articles on mushroom poisoning to its publication, *Torreya*. He was known as an amateur mycologist, as well as a naturalist of broad interests.

Receiving his medical degree from Columbia University in 1886, Dr. Douglas did post-graduate work in opthalmology and otology in Vienna, Berlin, and Paris between 1890 and 1892. Except for those years, he practised medicine in New York City continuously from 1886 until 1928, when he retired. He was an interne at Presbyterian hospital for two years after his graduation, then became assistant surgeon in the out-patient department. Upon his return from abroad he joined the staff of the Manhattan Eye and Ear Hospital as surgeon. From 1898 on, he was a professor in the New York Post-Graduate Medical School and Hospital.

He was noted for the invention of the tonsillotome and other medical instruments for nose, throat, and ear surgery

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Membership in
THE NEW YORK BOTANICAL GARDEN
and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

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Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

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* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
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Garden Club Affiliation	25	Patron	5,000
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All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

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1947

PAGES

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

FEBRUARY EVENTS AT THE GARDEN

Art Exhibit

See opposite page for details.

Members' Day

3:30 p.m. in the Members' Room

Feb. 5—***Dr. Hosack and the Elgin Botanical Garden*** — *Clarence McK. Lewis*

Saturday Afternoon Programs

3 p.m. in the Lecture Hall in the Museum Building

Feb. 1—***Afternoon in Mexico***—A series of motion picture shorts

Feb. 8—***Protective Devices in the Insect World*** — *Louis Pyenson*

Feb. 15—***Wild Flowers and Other Bits of Nature*** — *Samuel Gottscho*

Feb. 22—***Forest Treasures and Doorway to Happiness***

Two motion pictures from the lumber industry

Radio Programs

Alternate Wednesdays at 5:45 over WNYC (830 on the dial)

Feb. 5—***How to Keep your House Plants Healthy*** — *Chris G. Schmitt*

Feb. 19—***Mid-Winter Use of the Small Greenhouse*** — *Ernest Chabot*

Course

Feb. 19—***Nature Study for Teachers*** — *E. E. Naylor*, Instructor

15 Wednesday afternoons, 4-6 p.m. — **$5.**

Forthcoming Events

Members' Day: March 5, "Nature's Gamble in Producing New Plant Forms" by A. B. Stout. *Saturday Programs*: March 1, "Spring Flowers in Crete" by Professor and Mrs. Clarence H. Young; March 8, "Rock Garden Construction" by A. C. Pfander; March 15, "Exploring in Tropical America" by G. H. H. Tate. *Radio Programs.* March 5, "Starting a Garden of Herbs" by Marcia Garrick; March 19, "Exploring in Nyasaland" by Harold E. Anthony. *Course*: Plant Propagation, E. E. Naylor, instructor, four alternate Saturdays, 2-4 p.m., beginning March 1, $5. *International Flower Show*: Grand Central Palace, March 17-22. The New York Botanical Garden will show a plant explorer's jungle camp.

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Winslow Homer Exhibit At Wildenstein

MORE than 100 works of the nineteenth century American artist, Winslow Homer, will be shown in an exhibition at the Wildenstein Galleries, 19 East 64th Street, New York City, from Feb. 19 through Mar. 22. Arranged jointly by the Galleries and the Garden's Manhattan office, the exhibit will be presented for the benefit of the Garden's endowment fund. The admission charge will be fifty cents a person, and the gallery will be open each week from Monday through Saturday from 10 a.m. to 5:30 p.m. For the preview, which will take place the evening of Tuesday, Feb. 18, the tickets are priced at six dollars each.

In the 40 canvasses, 45 watercolors, and 19 drawings to be on view, Winslow Homer's love of nature is made evident. The artist led an ardent outdoor life, and he frequently painted people in their relation to nature, either working or playing outdoors. Although he visited England and France, he painted mostly American scenes, though some influence from the English seaside crept into his work. After visiting Florida and Bermuda, his painting took on more vividness, and he used watercolors chiefly in depicting scenes from these two places. The cover illustration, entitled "In the Jungle, Florida," is an example of this period.

The Botanical Garden's exhibition at the Wildenstein Galleries will be the most comprehensive of Winslow Homer's works since the Whitney Museum displayed his art in 1936, a quarter-century after his death. Lloyd Goodrich, Associate Curator at the Whitney and this country's authority on the artist, is collaborating in arranging the forthcoming show. It is a loan exhibition, with pictures coming from museums, galleries, and private collectors all over the country. Seventeen of the pictures are in the Wildenstein Galleries' own collection.

The Chrysanthemum...

Its Story Through the Ages

*By S. L. Emsweller**

For nearly three thousand years this regal flower of the autumn season has been cultivated for the delight of man. Its present forms are manifold, varying widely and often unpredictably from the probable wild species from which, in the beginning, they were derived. The scantily recorded history of the garden chrysanthemum, from its ancient Chinese origin to the scientific breeding of the twentieth century, is brought to light in this article.

THE chrysanthemum flower is one of the patriarchs among those that man has long grown for the pure pleasure of his soul. The culture of improved forms is known to antedate the Christian era by many centuries. All the evidence points to China as the native home of the chrysanthemum. According to some Chinese writers it was being grown in China as early as about 1000 B.C., at a time when most of Europe was a complete blank insofar as authentic history is concerned. The Chinese were growing improved forms as early as 500 B.C.

According to the Japanese, chrysanthemums were introduced into Japan from China about 724 to 749 A.D. At first they were grown in the gardens of the Imperial Palace. Soon, however, they became popular with the nobility and finally with the masses of the people. Within a short time they were regarded as the queen of flowers.

The first chrysanthemums reached Europe in 1688. Today it seems strange to us that such lovely flowers had not attracted the attention of Europeans at an earlier date. Probably they did, and very likely earlier attempts to import them met with failure because of the inability of the plants to survive the long, hard passage from the Orient. In 1689 several varieties were reported as being grown in the Netherlands, but for some unknown reason these varieties soon passed out of cultivation.

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* Dr. Emsweller is Principal Horticulturist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture, Beltsville, Maryland. The paper presented here comprised the introductory section of an address on chrysanthemum breeding given at the New York Botanical Garden last October 26, during the chrysanthemum show and program staged in co-operation with the Eastern States Chrysanthemum Society.

In 1764, just 76 years after the first European importation, chrysanthemums made their first appearance in England. They were popular immediately and additional varieties were brought in from China in 1789. During the period 1789—1809, eight new types were introduced from China.

Unfortunately the early history of chrysanthemums in the United States is very obscure. According to the 1828 catalogue of William Prince they were first introduced in 1798 at Hoboken, New Jersey, by a certain John Stevens. In the absence of information to the contrary it may be assumed that this date is probably correct, although chrysanthemums had then been known in England for 34 years. The first plants reaching America were probably a dark purple form that had been introduced into Europe from China in 1790. In 1826 the Prince Nursery listed 26 varieties and by 1835, according to Hovey's *American Gardener's Magazine and Register,* 50 distinct varieties were available in this country.

All of the early varieties introduced from the Orient were brought in as living plants. Insofar as we know, the first attempts to grow seedlings in Europe were made about 1827. At this time a Frenchman, M. Bernet, flowered several fine seedlings from seed he found in withered flower heads the previous autumn. Following this it is highly probable that many amateurs began growing seedlings, but unfortunately there are no records.

We have no record whatever concerning the origin of the 50 varieties listed in the United States in 1835. Very probably they were varieties from Europe, propagated entirely by cuttings and crown divisions. Since propagation by these methods was so simple, there was little incentive to grow seedlings. In fact, the existence of but 50 types in the United States by 1835 is an indication that very little actual improvement by means of growing seedlings had been attempted.

One of the earliest chrysanthemum breeders in this country was Robert Kilvington, of Philadelphia. In 1841 he exhibited a new seedling named ***William Penn*** before the Pennsylvania Horticultural Society. It bore a large white double flower, almost globular in shape. While this new variety received favorable comment it did not stimulate additional work, and no other contributions appeared for some time. About 1850 Samuel Brookes of Chicago became very much interested in chrysanthemums and did considerable work to stimulate interest in the flower.

A general interest in chrysanthemums was slow to develop in this country. In 1844 an impressive display was made of many of the available varieties at the fall show of the Massachusetts Horticultural Society. Two years later there was a large exhibit before the Pennsylvania Horticultural Society, where the chrysanthemum was described as the coming flower. A special chrysanthemum show was not held, however, until 1868. At the present time there are many chrysanthemum exhibits each year.

Previous to 1850 chrysanthemums were not grown as greenhouse plants. About this time a few varieties were tried under glass, and development of special florist types was soon under way. The florists soon extended the blooming period and made it possible to market the large showy types that were being introduced from Japan. About 1883 Hosea Waterer imported about 50 varieties from Japan. Shortly following this a large white variety appeared that was so attractive it is said to have been sold for a fabulous sum. This variety was sent to Mr. and Mrs. Alpheus Hardy and undoubtedly was one of the stimulating influences that led to a quickening of interest in chrysanthemum breeding in this country. Some of the successful breeders of this period were T. H. Spaulding, E. Fewkes, Pitcher and Manda, V. H. Hallock, W. C. Pyfer, E. G. Hill, and F. Dorner and Son. By 1894 there were listed 163 varieties of American origin.

Among the more recent breeders of chrysanthemums one finds the name of Elmer D. Smith, of Adrian, Michigan. By 1928 he had introduced 445 new varieties, and many others have been added since that time. Others of this period are E. M. and J. W. Byrnes and F. L. Mulford of the United States Department of Agriculture. Mulford's hardy outdoor variety ***Algonquin*** is still one of the finest yellow chrysanthemums of its class. More recent has been the work of V. R. De Petris, of Detroit, Michigan, Alex Cumming, Jr., of Bristol, Connecticut, Baur-Steinkamp, of Indianapolis, Indiana, Yoder Brothers, of Barberton, Ohio, and the Styers of Concordville, Pennsylvania.

Just what is the origin of the modern chrysanthemums? Before World War II the Japanese claimed to have about 5,000 varieties. In Europe there are probably at least half this number, and here in our country the number is not known but probably runs into several thousand. What is the original species that could have given rise to this enormous variation? This is a question that has received considerable speculation and about which thousands of words have been written. So far, however, there is no evidence in favor of any particular species that will stand up under critical examination.

One of the speculations most widely disseminated and now accepted by many as a fact is that our present-day florist and garden chrysanthemums were derived from *Chrysanthemum morifolium* and *C. indicum*. The large-flowered varieties are supposed to have come from *C. morifolium* and the small-flowered ones from *C. indicum*. While this may prove to be true, thus far it is based purely upon inference and is not supported by any critical evidence.

There are several ways in which we might attack the problem of discovering the parent or parental species of our chrysanthemums. If *C. morifolium* and *C. indicum* are the primary types, then we might be able to derive these two species from our modern varieties by a program of so-called inbreeding. This could be done by pollinating a variety with its own pollen, select-

ing among the seedlings those most nearly like the alleged parent species, and repeating the self pollination. If the original factors or genes that compose *morifolium* are present, such a program should eventually produce a *morifolium* plant. It is extremely unlikely, however, that either *morifolium* or *indicum* could be secured in this manner. If this method is sound it should also be possible to derive our present-day varieties by a breeding program involving the alleged parents, *morifolium* and *indicum.* Our modern varieties, however, probably contain relatively few genes exactly as they were in the original primitive parental type or types.

Jojoba—An Oil-Producing Plant Of the Southwestern States

By Margaret Douglas

GROWING WILD in desert regions of the southwestern states is an oil-producing plant of considerable promise, locally called the goat-nut or JOJOBA (both J's pronounced as in Spanish, with the sound of an H). Known to the early Indians there, who used its fruits for food and beverage, it was adopted to a small extent by the white settlers, who also used its oil in cookery and medicine. Only in recent years, however, have its commercial possibilities become evident. An experimental planting has been made at the Boyce Thompson Southwestern Arboretum at Superior, Arizona.

The author of the following description of the jojoba and its uses, Mrs. Walter Douglas, for many years has been making keen and valued observations on the plants which grow wild about her winter home in Phoenix, as well as in Mexico, where she has traveled extensively.* To her observations recorded here, technical notes have been added by Dr. George S. Jamieson of Washington, D. C., author of "The Oiticica Tree of Brazil and the Oil from its Seeds," which appeared in this Journal for October 1946.—C. H. W.

MY attention was first called to the JOJOBA when some friends of mine in 1944 bought twenty acres of desert land in Paradise Valley, near Phoenix, in order to enjoy the great variety of plant life in our district. By surrounding the property with a fence, they protected the plants from

* See her article on the huanita, a rare, fragrant-flowered tree of Mexico, in the Journal for May 1946.

Five-year-old plants of Simmondsia californica, four feet high, at the Boyce Thompson Southwestern Arboretum at Superior, Arizona.

the encroachments of cattle and other destructive elements. This particular spot abounds in the varied desert flora: owl clover, phacelia, delphinium, many of the compositae, yucca, ocotillo, numerous kinds of cacti and lupines. But the shrub in which we were particularly interested, quite apart from its economic value—one which grows luxuriantly in this locality—was the goat-nut or jojoba, *Simmondsia californica*.

This shrub also grows very well at the Boyce Thompson Southwestern Arboretum, in Superior, Arizona. Not long ago, while visiting Mr. Fred Gibson, Director of the Arboretum, he showed us some of the large plants of the jojoba, and later on the products. I was informed that the plant, which belongs to the Box family, was first described by Thomas Nuttall as being found at San Diego, and he named it *Simmondsia californica* in honor of the botanist, Thomas W. Simmonds, who died in Barbados in 1804. However, Mr. Gibson tells me that the botanist H. F. Link came earlier with the name *Buxus chinensis*, thinking the plant was of Chinese origin. Therefore, while *Simmondsia chinensis* is botanically correct, it furthers an error of conception.

John Torrey mentions the jojoba in 1859, in "Botany of the Boundary" (in the report by W. H. Emory, on the United States and Mexican boundary survey), and calls it *Euphorbia*. Mr. Gibson says that while it is in the Box family, it is also very near the Euphorbiaceae.

Paul C. Standley tells of the jojoba occurring in Sonora and Lower California, besides the already-mentioned type from San Diego, and says, among other things, in his "Trees and Shrubs of Mexico":

> "The seeds contain about 48% of oil, which is used locally as a hair tonic . . . The first reference to the plant is that of Clavigero, (Historia de la California, 1789), whose account is as follows: 'The *jojoba* is one of the most highly valued fruits of California . . . has become noted because of its medicinal virtues . . . as a cure for wounds . . . remedy for cancer'. . . . The plant does not bear fruit every year, but only when there has fallen at least a heavy shower in the winter."

The oval, box-shaped leaves are a dull sage-green, and grow to one or one and a half inches long. The flower in shape resembles a berry with five sepals, and has no apparent outer change when it becomes a fruit, except the retrogression of the two small horn-like projections of the stigma after pollination. When the fruit develops, it is somewhat like an acorn, and the so-called nuts have long been eaten by Indians and others. It makes a good browse plant and cattle are fond of both fruit and leaves.

Most botanists overlook the fact, which Mr. Gibson calls attention to, that the jojoba is dioecious, and he has counted the sexes as they appear in nature, and found them to be balanced. Most of the descriptions leave

FLOWERS AND FRUITS OF THE JOBOBA

The berry-like pistillate, or female, flowers are at the left. The staminate, or male, flowers from a different plant are shown in the center cluster. At the right is a specimen of the ripe fruit, all about three-quarters natural size.

one to infer that both staminate and pistillate flowers are borne on the same plant, but the male (staminate) flowers are in clusters on one, while the female (pistillate) flowers occur singly on another. The plants are generally from two to four feet high. In places where the jojoba finds a friendly foothold, these shrubs sometimes grow so closely together that the branches mingle and give the effect of having male and female blossoms on the same plant, which leads to a mistaken determination. The dioecious character of the plant relates to the future economic possibility of growing it for oil.

During 1933, R. A. Green and E. A. Foster were the first to discover that the so-called oil was a liquid wax, whereas all other known seeds contain fatty or glyceride oils. Sperm oil is another liquid wax. Those who are interested in growing it are warned that if they set out such plantings of seedlings, only half will bear seed. Jojoba does not transplant except as seedlings with roots undisturbed. Seeds are the best way to propagate—they come up after summer rains.

The economic properties of the jojoba oil were discovered about ten years ago.† The factis, or rubber-like substance, made from the oil, was patented by Carleton Ellis. Another patent was granted last year to Doctor Ilona Taussky, for the use of the oil in shortenings and other food products to delay their becoming rancid.

About six years ago, a patent application was made covering the hydrogenated wax. Someone else has patented the liquid wax as a lubricant for delicate instruments. It has also been patented for use in preparing a printer's ink. Candles made from the hydrogenated wax do not melt before being used—even in the burning hot Arizona climate. In hardness jojoba ranks next to carnaúba—even being used for some purposes in competition with carnaúba.

Another product of this remarkable seed is stock feed, which can be made from the residue after the oil is removed. This same residue also can be used for plastics.

A coffee-like beverage has been made from the seeds ground and roasted. Sometimes the fruits are eaten raw, directly from the bushes.

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† New light is shed on the progress—or rather, lack of progress—in introducing jojoba into commercial culture through an article that appeared in *The Arizona Farmer* Dec. 14, 1946. Under the heading "Durkee Co. Drops Jojoba Program," the item reads, in part:

"Except for 20 acres, the jojoba nut program in the Magma district is terminated.

"This decision is a sharp reversal from last spring's plans. Thousands of dollars were then spent to plant new acreage to jojoba, and the intention was to expand to 640 acres next year. Now the new plantings have all been plowed up.

"It is still undeniable that the liquid wax extracted from jojoba nuts, also known as coffeeberries and bucknuts, is a product of enormous possibilities in the varnish industry and allied lines. But the Durkee and Glidden people decided that it would take too long to get jojoba established as a commercial crop."

Photographs from Fred Gibson, Director, Boyce Thompson Southwestern Arboretum

Vanilla-Growing on Dominica

By Leo H. Narodny

THE steep shores of this Antillean island are a vanilla-growers' paradise, and the peasants rely mainly on the culture of this fragrant orchid as their source of income. Mr. Narodny, who has lived for several years on Dominica, here describes the way the vines are grown and the pods are processed for consumption in the United States.

THE island of Dominica in the British West Indies has recently become one of the largest producers of vanilla in the Western Hemisphere. Located on the westernmost boundary of the Caribbean Sea, at the same latitude (15° north) as Guatemala on the eastern boundary, an ideal location seems to have been found for this terrestrial orchid, *Vanilla planifolia.*

Introduced many years ago by Jesuit priests, this orchid has been planted throughout the rain-forest of this mountainous little island. It normally climbs up thirty or forty feet and when it has outclimbed its supporting tree, it sends down free hanging sprays. In the dry season, which starts in February, these hanging sprays throw out clusters of small yellow orchids, the fruits from which are harvested nearly a year later.

The crop is cultivated almost entirely by negro peasants in their small gardens, some having only a single vine. An old plant growing under ideal conditions can bear more than thirty pounds of green beans, but this is exceptional. More often a vine will produce about a pound of green beans, which when cured make about three ounces of vanilla, worth about a dollar to the peasant. It does not take many vines to provide a good part of the income of these peasants, who have very modest requirements. The price of vanilla now is so high that the fifty thousand pounds of cured beans comprised the most valuable of the island's exports in 1945. In fact, in the Carib Reserve, which has been described in a previous article in this Journal, "Plants Used by the Dominica Caribs" by W. H. Hodge, August 1942, vanilla forms the main source of income today. It is quite a sight to see the mongoloid Caribs carrying hundred-pound bags of these valuable green beans on their heads for ten or fifteen miles to the dealers or to the co-operative association which cures and markets their beans.

The vanilla plant is sometimes grown under coffee trees, which, some two hundred years ago, were the most valuable crop of this island. The heavy shade of coffee is so dense, however, that the plant rarely blooms in the dimness beneath unless the branches are trimmed. Therefore, toward the end of the year, the trees on which the vanilla is grown are pruned away. This gives the vanilla plant more light and thus induces it to bloom

In Dominica, the best supporting tree for vanilla vines seems to be hibiscus. The plant on the left is bearing several pounds of green beans. On the right a vine is shown clinging to a tree-fern stump. After reaching the top, the plant continues to grow, eventually dropping to the ground and climbing up again. Growers always keep the vine within reach, to facilitate pollination and picking.

during the ensuing dry season, and also keeps the supporting plant from losing all its leaves, which it would otherwise normally do at this time.

Pollination of the vanilla orchid is done by hand, usually with a small piece of wood or a safety pin, and the flower almost immediately wilts. Only self-pollination is practised, as cross-pollination would be too slow. An experienced girl can pollinate more than six hundred flowers from sunrise to noon, when the flowers are fresh. The temptation to pollinate too many flowers on a young plant weakens the plant and renders it liable to disease. Almost every peasant has lost a good part of his original plants in this way. Seldom is a naturally pollinated bean found, nor is it found in Mexico, the original home of the species.

In a few months the pods attain a length of eight inches or more, but they do not ripen until eight or nine months later.

In order to prevent theft or, as it is called in Dominica, "praedial larceny," no beans may be plucked before January 15, and many growers brand their beans by writing their initials with a pin on one side of the pod, thus making an indelible scar.

The considerable amount of personal care needed for cultivation prevents this crop from becoming a large-scale estate crop and will tend to keep it in the hands of peasants. This is also true in Mexico where the Tatonoco Indians near Vera Cruz care for the vine on small holdings averaging five acres. Although some peasants attempt to cure their own beans, the best results are obtained by curing on a large scale. The local Dominica Vanilla Growers Association sorts the beans for quality and scalds them in hot water for a few seconds and then places them in small boxes covered with woolen blankets. In a day or two the beans begin to sweat from the heat generated by their own enzyme activity. They are then placed in the sun to dry. Later, when they have reached one-fifth of their original weight, they are conditioned in boxes. No aroma appears until the conditioning process, which lasts several months, has fairly well begun.

Vanillin, one of the principal constituents of vanilla, is also made from the waste pulp of paper mills in Canada and northern United States, but this is by no means the only ingredient of cured vanilla, which has a mellow, rich flavor—a blend of several unknown ingredients in addition to vanillin.

More than a million pounds of beans normally go to the United States,

During February, the streets of Roseau, capital of Dominica, are lined with vanilla beans, curing in the sun. This shows about $40,000 worth of beans offering a novel obstruction to traffic.

Vanilla money often is spent within two days during Mardi Gras festivities in Dominica. The streets that were lately blocked by drying beans are now thronged with masked people celebrating the carnival with native songs and dances.

mostly to flavor ice-cream. Although the price is high, close to eight dollars a pound now, the amount used to flavor ice-cream is so small that the cost of flavoring with real vanilla is only about ten cents a gallon, and in spite of the production of thousands of pounds of artificial vanillin, the market for natural vanilla continues. The economic life of Dominica depends on public preference for the real vanilla flavor, which fortunately is a well established habit in the U.S.A.

The cured seed pod of this pretty orchid, grown in such out-of-the-way coastal regions as those of Mexico, Madagascar, and Dominica, provides the supply of this flavoring to the rest of the world. Vanilla can grow in many parts of the world, but only near the sea and between the latitudes of 10° and 20° north and south has it been found to flourish. If we add to these requirements those of steeply sloping land, a heavy rainfall, and a predominantly peasant proprietor, it is easy to see why Dominica is one of the very few places in the world where vanilla will probably continue to become more important because of large undeveloped areas.

The pictures show the unobtrusive and almost invisible vanilla plants. It is very difficult to see the succulent green leaves and stems in the shade of the support tree, and equally difficult to see the long green beans in the

heavy foliage. A vanilla plantation, to a casual observer, looks like an abandoned clearing in the forest, and some of the most valuable crop land in the world, producing over a thousand dollars per acre, looks completely worthless.

There are other forms of vanilla, some three or four, which grow wild in the island, but none has become of any importance.

Vanilla is the only orchid cultivated for anything except its flower.

BROADCAST

By J. H. Beale

Suitable Trees for the Home Grounds

SO many requests were received for the list of trees suggested by J. H. Beale, Superintendent of the Arboretum at the Boyce Thompson Institute, when he spoke on the New York Botanical Garden's radio program over WNYC *Oct.* 16, *that the entire manuscript on which the broadcast was based is presented here.*

IN making a choice of trees to plant on his property, the first question the home-owner must answer for himself is:

"For what purpose is the planting being undertaken?"

Is the idea to provide shade where one may relax on hot summer days; or is it purely to add a decorative note—an accent—to part of the garden? Or is it to become a focal point from a window, a porch, or a favorite seat in the garden?

Then comes the question: *"What kind of tree makes the greatest appeal to me?"*

Is it the year-round dignity of the evergreens; the stateliness and seasonal foliage changes of some of the larger deciduous trees; or is it essentially the beauty of the blossoms, leaves, and fruits that is desired?

When these points are settled, there still remains that very important consideration:

"How much space can we devote to trees without overcrowding other plants in their near vicinity?"

In many suburban gardens, this point will greatly influence the final selection.

Evergreen Trees and Other Cone-Bearers

Let us begin with the evergreen trees. As a whole they grow more slowly than deciduous trees of similar age, and not for a great many years do they develop spreading heads. Therefore, any shade they cast is lateral rather than overhead shade.

The light, feathery grace of the common hemlock (*Tsuga canadensis*) can

hardly be surpassed by any other evergreen tree but, in common with all evergreens, its lower branches must have room to spread if it is to appear at its best. The Carolina hemlock (*T. caroliniana*), which is not as well known as it deserves to be, has a denser habit and shorter branches, but is not so readily transplanted in the larger sizes.

The eastern white pine (*Pinus Strobus*) is another beautiful tree, but grows too rapidly except for positions where it has ample room. The native red pine is also good, and has long, soft needles similar to those of the white pine, but they are green instead of gray.

The Austrian pine (*P. nigra*), one of the most satisfactory of introduced pines, is much stiffer in appearance than either of those just mentioned, does not grow as rapidly, and is more compact.

Of the spruces, the Norway spruce (*Picea Abies*) has been more commonly planted than any other, and makes a handsome tree unless attacked by spruce gall aphis. A much more recent introduction is the Serbian spruce (*P. omorika*), which in color and rather narrow habit of growth is superior to the Norway. The Colorado blue spruce (*P. pungens glauca*), and the still more brightly colored Koster blue spruce (*P. Kosteriana*) are too well known to require further comment except to remark that not infrequently both are planted in entirely unsuitable surroundings. They are best in formal situations. The Oriental spruce (*P. orientalis*), with very short needles and of dense, comparatively slow growth, is good for rather restricted positions in small gardens.

The firs are more striking in appearance than the spruces, but not many of them succeed in this region as they prefer cool, moist atmosphere. The white fir (*Abies concolor*) with rather long needles (two inches) is one of the best. Add the Nikko fir (*A. homolepis*), the Nordmann fir (*A. Nordmanniana*), and the Veitch fir (*A. Veitchii*), and you have those most satisfactory for this climate.

The Douglas fir (*Pseudotsuga taxifolia*), though not a true fir, is another valuable ornamental tree that must not be overlooked.

The larches are among the very few cone-bearing trees that lose their leaves in winter. Two kinds are frequently grown, the European (*Larix decidua*), and the Japanese (*L. leptolepis*), and of the two the Japanese is the more desirable. Both kinds grow rapidly, and few trees exhibit such a delicate green tracery as do the larches when the leaves begin to appear in spring.

The Larger Deciduous Trees

The oaks and beeches are usually too large for the average garden, but there is sometimes a place for a real shade tree near the house. The pin oak (*Quercus palustris*) has rather small leaves, and the head of the tree retains the form of a pyramid, and the shade it casts is not very dense. The red oak (*Q. rubra*) transplants well and grows rapidly. Eventually it develops a rounded head, and its autumn coloration is quite striking. The scarlet oak (*Q. coccinea*) has still more brilliant fall foliage, and with age, a somewhat open head.

The European beech (*Fagus sylvatica*) is generally a smaller tree than its American counterpart. Though neither of them can in any way be considered as small trees, in their early years both grow rather slowly. The European beech is probably better known in its weeping form, or as one of several varieties with colored foliage, referred to as purple or copper beeches. Another variety is the fern-leaved beech, so called from the deep serrations in the edges of the leaves.

Maples are familiar trees, and the Norway maple (*Acer platanoides*) is planted much too often, except as a street tree. It makes such a dense shade, that, combined with its habit of producing roots near the surface of the ground, it is impossible to maintain a carpet of grass beneath its branches.

The sugar maple (*A. saccharum*) is a more refined tree, but is open to much the same objections as the Norway. The silver, or soft maple (*A. saccharinum*) grows rapidly and its branches break very easily. It is the least desirable of the commoner maples. The red maple (*A. rubrum*) is beautiful in flower and in its fall coloring, but it requires a moist soil and is also surface-rooting.

Smaller Trees for Ornament

The birches are much smaller trees, and those with white trunks are highly ornamental. The indigenous gray birch (*Betula populifolia*) is frequently planted,

and with its cluster of white stems arising from a common root makes a striking lawn plant. However, still more commonly used is the European white birch (*B. pendula*), or its cut-leaved form (*B. p. dalecarlica*), both of which have drooping branches which add to their attractiveness. Of the various white-stemmed birches the canoe birch (*B. papyrifera*) with its white bark peeling in thin strips, is the most desirable, though it makes a larger tree. The river birch (*B. nigra*) is distinctive in its peculiar rich brown, broken, flaky bark, and is a good plant for wet places.

Everywhere in this region the mountain ash (*Sorbus Aucuparia*) was outstanding in the fall of 1946 in the beauty of its quantities of orange-red berries. Here is a small tree that provides an annual display, and does not cast a very dense shade. But keep a close watch for stem borers!

Trees with Showy Flowers

The white, pendent flowers of the silverbell (*Halesia carolina*) appear just before or with the leaves. It makes a small tree with a loose, open habit of growth, and its four-winged fruits, though inconspicuous, are unusual.

Many of the magnolias become large, but no other tree is more striking when in flower. The saucer magnolia (*Magnolia Soulangeana*) with its purplish and white flowers is familiar to everyone, as it is much more often planted than any other. The yulan (*M. denudata*) grows into a small, wide-spreading tree that bears large white flowers before the leaves appear. But, as with other magnolias of similar early flowering habit, the flowers are sometimes injured by late frost or cold winds. The umbrella magnolia (*M. tripetala*), with leaves 12-24 inches long, also has large white flowers, but they do not appear until after the leaves are in evidence. The whiteleaf Japanese magnolia (*M. obovata*) though both leaves and flowers are a little smaller than those of the umbrella magnolia, has more striking flowers because of their bright scarlet filaments. A very much smaller plant in every way is the sweetbay (*M. virginiana*) which does not flower until June and July. Though evergreen in the South it is deciduous in this area.

The violet color of the flowers of the empress-tree (*Paulownia tomentosa*) is unusual, and though the tree is not uncommon about New York it is always an object of interest. But the branches break rather too easily during high winds, for the tree grows rapidly and the wood is soft.

Distinctive in many ways is the golden-rain tree (*Koelreuteria paniculata*), another small tree which, in July, produces its small yellow flowers in large clusters on the ends of the branches.

The flowering dogwood (*Cornus florida*), at any season of the year, is one of the handsomest of small flowering trees, and 1946 was one of its outstanding years. In spring the trees were completely covered with flowers which later became innumerable scarlet berries surrounded by brilliantly colored foliage. The pink-flowered form provides a pleasing contrast to the white. Less familiar is the Asiatic kousa dogwood (*C. kousa*) that differs from its American cousin in its later flowering, in the pointed floral bracts below the flowers, and in its strawberry-like fruits.

Flowering Crabs and Cherries

All of the crab-apples are exceedingly showy in bloom, and many of them have the additional attraction of fruits that are almost as showy. Mention can only be made of some of the better ones, for example the Carmine, the Dolgo, the Japanese, the Rose, the Toringo, the Chinese, and the Eley Purple. Among the double-flowered forms the Bechtel crab is remarkable not only for its comparatively large flowers, but also for its delightful rose odor. The double flowers of the Parkmann crab are a pleasing shade of pink, and the flowers of the Veitch crab could readily be mistaken for an oriental cherry. There are one or two weeping forms of which Elise Rathke is, perhaps, the best.

Of the oriental cherries the weeping Higan cherry (*Prunus subhirtella pendula*) is the one most frequently grown. Another good single-flowered one is the Fuji cherry, in which the almost white flowers are produced in quantities just before the leaves.

There are a great number of double-flowered forms, but unfortunately the

buds of these are often injured or destroyed by frost. Two popular varieties are Kwanzan and Kofugen, both with pink flowers.

There are many other trees, both large and small, worthy of consideration by anyone who proposes to do some planting. And as trees are permanent occupants of the garden it is well worth while to consider the merits and demerits of a great many before making a final selection.

Lectures Given on Flower Shows

THE 1947 series of invitation lectures given by the New York Botanical Garden began January 16 with a talk by Richardson Wright, Editor of *House and Garden*, entitled "What Went Before." The purpose of this series of six lectures, which have been given at the home of Mrs. John Sloane, has been to interpret flower shows and their significance. Subsequent addresses, occurring every Thursday morning and concluding February 20, have been announced as follows:

"How to Grow Plants of Exhibition Quality in Your Garden" by James B. Jack, Superintendent, A. A. Cook Estate, Mt. Kisco, N. Y.

"You Can Grow Indoor Plants Too" by James G Esson, Superintendent, Mrs. Roswell Eldridge Estate, Great Neck, L. I., and Editor of the *Gardeners' Chronicle of America.*

"Catching the Judge's Eye" by George H Gillies, Head Gardener of the Marshall Field Estate, Huntington, L. I.

"You May Be Asked to Judge" by Edwin Beckett, Superintendent, Mrs. Herbert N. Straus Estate, Red Bank, N. J.

"The Gardens and Flower Shows of the Future are Yours" by F. F. Rockwell, Editor-in-Chief of *Home Garden* magazine.

This program has been arranged by the New York Botanical Garden's Manhattan office, with Mrs. Melvin E. Sawin and Mrs. John D. Beals, Jr., acting as co-chairmen of a committee which includes Mrs. B. Tappen Fairchild, Mrs. Arthur Lehman, Mrs. Harold I. Pratt, Mrs. Donald B. Straus, and Mrs. Thomas J. Watson.

Dr. B. O. Dodge Retires from Staff

TWENTY YEARS in which scientific research in the genetics of the fungi has gone hand in hand with a program of practical work in plant pathology at the New York Botanical Garden were officially brought to conclusion at the end of 1946 with the retirement of Dr. B. O. Dodge as Plant Pathologist. Unofficially, however, much of the work still goes on, with Dr. Dodge returning to his desk and laboratory every day.

During the years that Dr. Dodge has been at the Garden, he has been directly responsible for the health of all the plants grown and maintained for display and landscaping, and he has won recognition especially for the excellent condition of the rose planting. In his studies of black-spot and in methods of control for this devastating rose leaf disease he has worked in part in co-operation with Dr. L. M. Massey of Cornell University. Among other ornamental plants to which he has devoted research projects as well as every-day attention are delphiniums, hollyhocks, iris, pelargoniums, cacti, and chrysanthemums. In recent years he has worked on pachysandra and boxwood, among other plants, and has been largely responsible for the discovery and identification of diseases troubling these plants. Results of his work have been published in the *Journal*, in *Mycologia*, and in other periodicals.

Working with the pink bakery mold, *Neurospora*, Dr. Dodge has convinced other scientists that these fungi are capable of mutating and hybridizing just the same as higher plants. This has been one of the few major research projects in genetics ever undertaken with one of the fungi and in addition to its importance in science, it has had a far-reaching economic effect. Until this fact was known, breeders of disease-resistant crop plants, such as wheat, were baffled by the loss of resistance of their new varieties after a few years. Dr. Dodge's observations of the rise of new strains of fungi through natural hybridization gave them a clue to their difficulties and pointed the way to a new approach to their problem of developing plants which would be immune to fungus diseases.

It was this work which won for Dr. Dodge, a number of years after it was first accomplished, membership in the Na-

tional Academy of Sciences. He is also a member of the American Academy of Arts and Sciences and numerous other scientific organizations. He has held more offices in the Torrey Botanical Club, including that of editor, than any other member, and in recognition of this, volume 74 of the *Bulletin*, which is almost coeval with him, will be dedicated to him and will contain a portrait and biography.

During his years at the Garden he has been one of the only two plant pathologists concerned with diseases of ornamental plants serving the metropolitan area, and in this capacity has given immeasurable help to home gardeners and to other institutions. He has also been responsible for the training of the Garden's student gardeners in plant disease control, through his teaching in the Two-year Science Course for Gardeners. In addition, he has taught genetics of the fungi to Columbia University graduate students in botany.

The result of his many years of work in plant diseases contributed to a 638-page volume, "Diseases and Pests of Ornamental Plants," which he wrote in conjunction with H. W. Rickett. The book was published in 1943 by the Jaques Cattell Press.

Dr. Dodge's first work at the Garden was between 1910 and 1914, when he was studying for his doctor's degree at Columbia University and subsequently teaching there. When he returned as Plant Pathologist twenty years ago, he came directly from Washington, D. C., where for eight years he had been pathologist in fruit diseases for the Bureau of Plant Industry.

When asked what his plans for the future were, a colleague interrupted the reply by remarking, "Dodge never knows until the day before, when he is going, where he is going, or why." However, an answer might be supplied by a quotation from Dr. R. A. Harper, whom Dr. Dodge once asked to suggest a title for a paper he was giving. Dr. Harper responded, "It doesn't matter what the title of your paper is; we all know what you're going to talk about."

So Dr. Dodge will undoubtedly continue working on *Neurospora*.

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Three Centuries of Books on Plants Exhibited

SOME of the earliest books on gardening and botany in occidental culture were exhibited at the New York Botanical Garden for the November Members' Day program by Albert E. Lownes of Providence, R. I., a member of the Garden and a collector of significant books of science and technology. Forty % of the books on display came from the New York Botanical Garden, but all except one represented volumes owned by Mr. Lownes. Although two of the works were written long before, the books exhibited dated from the late 15th to the beginning of the 19th century.*

The earliest volume shown was a 1483 edition, printed in Treviso, of Theophrastus's "De historia et causis plantarum" which was written about 300 B.C. Pliny, who wrote his "Naturiae historiarum" more than 300 years later, was represented by a 1497 edition printed in Venice.

Mr. Lownes exhibited what he called "the first edition in English of a mediaeval 'best seller'." The title was "De proprietatibus rerum" and the author Bartholomew the Englishman. This contains the earliest English illustration of plants.

The first pictures based on living plant material appeared in Otho Brunfels "Herbarum vivae eicones," published in Strassburg in 1530. Because of these, said Mr. Lownes, this book was a landmark in botanical history.

During the informal lecture which he gave concerning the volumes on display, he quoted from several of the books, among them Anthony Fitzherbert's "The boke of husbandry," published about 1533, a section of which told in charming style of a housewife's duties, reading in part:

"First in a mornyng whan thou art waken and purpose to ryse, lyfte up thy hande and blesse the, and make a sygne of the holy crosse. . . . And whan thou art up & redy, than fyrst swepe thy hous, dresse up thy dysshborde, and set all thynges in good ordre within thy hous, milke thy kye, secle thy calves, sye up thy mylke, take up thy children, and aray them, and provyde for thy husbandes brekefast. . . .

"And in the begynnynge of Marche or a lytell afore, is tyme for a wyfe to make her garden, and to gette as many good sedes and herbes as she can, & specially suche as be good for the pot and to eate/ and as oft as nede shall requyre it must be weded, for else the wedes wyl overgrowe the herbes. . . ."

The first English book that was truly devoted to gardening was Thomas Hyll's small book "The art of gardening" (London 1563). Thomas Hyll was known also for the excellence of his illustrations in "The gardeners labyrinth" (1577). Mr. Lownes showed slightly later editions of both of these historical books.

John Gerarde's "Herball" of 1597 was shown, as was John Parkinson's "Paradisi in sole" of a quarter of a century later. Among other books of interest (if one

* Only a few days after the exhibit was over, Mr. Lownes acquired an 18th century edition of Humphry Repton's "Sketches and hints on Landscape Gardening," which would have confined the display within the limits of the 18th century.

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could be said to draw more attention than another) were William Coles' "The art of simpling" (recently reprinted by the Trovillion Press, and previously reproduced in facsimile by Rosetta E. Clarkson), John Josselyn's "New England's rarities discovered," Van Rheede's "Malabaarse kruidhof" which is one of the best and earliest books of the flora of the East Indies, Engelbert Kaempfer's "History of Japan" (1728) showing for the first time Japanese plants and gardens, Mark Catesby's "Natural History of Carolina," and the famous folio by Nicolaus J. Jacquin, "Selectarum stirpium Americanarum historia," which came out in an edition of 20 copies or less. The New York Botanical Garden, as well as Mr. Lownes, owns a copy of this rare work.

Historical Exhibit on Paper-Making

FOR more than a month, beginning in mid-November, the New York Botanical Garden had on view in the Museum Building an exhibit showing paper-making from the earliest day down to the present. The exhibit was arranged by Harrison Elliott of the Stevens-Nelson Paper Corporation, who spoke on "The Art of Paper-Making" and gave a demonstration of the manufacture of paper by hand at the Saturday program of Nov. 16. Part of Mr. Elliott's exhibit consisted of panels showing vari-colored papers of his own manufacture.

Presenting a historical review of paper-making, the exhibit contained specimens of primitive and modern papers from the leading Asiatic and European countries as well as America. The explanatory labels and photographs showed the evolution of paper manufacture not only from the earliest day but even from the time when the paper wasp was the only creature on earth manufacturing genuine paper. Books printed on several types of paper, including the first that was made with corn stalks were shown.

Notes, News, and Comment

Boston Meeting. At the American Association for the Advancement of Science meeting in Boston, the week after Christmas, Dr. Bassett Maguire spoke on "Congeneric Aspects of *Lesquerella Kingii* and *Physaria Geyeri.*" Dr. W. H. Camp, who was chairman of the Systematic Section, spoke on "Distribution Patterns in Modern Plants and the Problems of Ancient Dispersals." Other members of the staff who attended the meeting were Drs. William J. Robbins, H. A. Gleason, Fred J. Seaver, H. W. Rickett, E. E. Naylor, and Ilda McVeigh, Dr. and Mrs. F. W. Kavanagh, and Selma Kojan. Reports from them were given at the staff conference January 16.

Annual Meeting. Frederick S. Moseley, Jr., was elected to the Board of Managers of the New York Botanical Garden at the annual meeting of the Corporation January 15. He fills a vacancy in the class of 1950 and was also elected to the Corporation of the Garden. Other newly chosen members of the Corporation are Mrs James Cox Brady, Mrs. Charles Burlingham, Mrs. Sidney G. de Kay, Mrs. Reginald Fincke, Mrs. O'Donnell Iselin, Mrs. Grafton H. Pyne, Mrs. Junius A. Richards, Mrs. Philip B. Weld, Howard Bayne, Leonard J. Buck, Charles B. Harding and Chauncey Stillman.

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Howard Bayne was appointed to fill a vacancy on the Finance Committee and Ralph A. Beals, the new Director of the New York Public Library, was named to the Scientific Committee.

In addition to Dr. William J. Robbins' summary of recent events at the garden, brief reports were given by Joseph R. Swan, President, Mrs. J. Henry Harper, Executive Assistant, Mrs. Robert H. Fife, Chairman of the Advisory Council, and by Dr. H. A. Gleason on his work on the flora of northeastern United States.

All officers were re-elected.

Torrey Representative. Dr. Fred J. Seaver has been appointed to the Board of Managers as a representative of the Torrey Botanical Club, succeeding Dr. H. A. Gleason, who has held the post since the retirement of Dr. Tracey E. Hazen from Columbia at the end of 1939.

Advisory Council. Mrs. Guthrie Shaw has been elected Corresponding Secretary of the Advisory Council of the Garden for 1947, succeeding Mrs. Townsend Scudder. All other officers will serve for another year: Mrs. Robert H. Fife as Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. William A. Lockwood, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary, and Mrs. F. Leonard Kellogg, Treasurer.

Mrs. James C. Mackenzie, Mrs. Joseph M. Proskauer, and Mrs. Joseph Wilshire were elected to the Advisory Council by the Board of Managers at the annual meeting Jan. 15.

Mrs. Henry J. Fisher, who had been a member of the Advisory Council since 1935, and of the Corporation of the Garden since 1936, died last Dec. 16.

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Members' Days. Sections of two distant continents were covered by speakers at the Members' Day programs at the New York Botanical Garden in December and January. At the meeting of Dec. 4, Leonard J. Brass reported on the Garden's first expedition in Africa—the Vernay Nyasaland expedition, on which he collected plants for the New York Botanical Garden. Among the guests at the program was Dr. Harold E. Anthony, also a member of the expedition.

Rodney Wilcox Jones, President of the American Orchid Society, and long a member of the New York Botanical Garden, entertained his fellow members January 8 with an account of his recent orchid-hunting trip to Brazil. He also showed kodachromes and described high spots of his 1945 South American trip, which took him mainly to Venezuela.

The program of February 5, at which Mr. Clarence McK. Lewis of the Garden's Board of Managers talked on "Dr. Hosack and the Elgin Botanical Garden," was inspired by the formal presentation on January 16 of an oil portrait of Dr. Hosack to the New York Botanical Garden. This portrait of the founder of the first botanical garden in New York has remained in the family since it was painted. Descendants of Dr. Hosack recently presented it to the Garden and it was formally accepted at the opening of the Garden's invitation lectures at the home of Mrs. John Sloane in New York.

A report of the November Members' Day meeting, at which Albert Edgar Lownes described 50 early garden books and herbals which he exhibited, is appearing elsewhere in the Journal.

Lectures. On January 5, Elizabeth C. Hall attended the eighth annual winter forum of the Alumnae Association of the School of Horticulture at Ambler, Pa., and spoke on "Garden Books of 1946."

Dr. A. B. Stout lectured to the staff and students in biology at Fordham University Dec. 19 on "Taxonomic and Genetical Studies of the genus *Hemerocallis.*"

Four garden clubs were invited by the garden department of the Women's Club of Great Neck, an Affiliate of the Botanical Garden, to hear a talk by E. J. Alexander January 20 on "Wild Flowers for Our Gardens."

Dr. W. H. Camp gave the annual William T. Davis memorial lecture at the

Staten Island Institute of Arts and Sciences January 18. His subject was "Timberline Trails from Mexico to the Yukon." On January 7 he spoke before the Hartford, Conn., Garden Club on "Plant Exploration in Southern Mexico."

Visitors. Dr. F. R. Fosberg, who has just returned from making a botanical survey of some Pacific Islands that had been in Japanese control, Dr. Robert E. Woodson of the Missouri Botanical Garden, Dr. Harlan Lewis of the University of California, Dr Fred Barkley of the University of Texas, Dr. E. P. Killip of the Smithsonian Institution, Professor Wilbur H. Duncan of the University of Georgia, Dr. Rogers McVaugh, University of Michigan, Dr. George J. Fritz of the University of California at Berkeley, Dr. Howard E. McMinn of Mills College, California, and Dr. Margaret H. Fulford of the University of Cincinnati, all spent some time in the Garden's herbarium during January. Luigi Fenaroli made a farewell visit to the Garden on his way back to Bergamo, Italy, where he is in charge of the Agricultural Experiment Station.

During the Christmas holidays some former student gardeners visited the New York Botanical Garden. They included Leonard Kline, now at California Polytechnic Institute at San Dimas; Ronald Townsend, Superintendent of the Edgar Stern estate in New Orleans; and Stephen G. Cutting, Superintendent for Mrs. John D. Rockefeller, III, at Ossining, N. Y.

Also visiting the Garden during January was Dr. Jacob Perlberger, Plant Pathologist, Agricultural Research Station at Rehovot, Palestine, who has been spending six months in this country

Other visitors have been Dr. and Mrs. Richard Wood of Northwestern University; Miss Alice Wood, Assistant to the Editor of the *Green Thumb*, bulletin of the Colorado Forestry and Horticulture Association; Joseph Smolen from the University of California; Antoinette Miele Wilkinson, Cornell; Charles J. Engard, University of Hawaii; Baki Kasaphgil from Ankara, Turkey; Jason R. Swallen, U.S.D.A. at Washington, D. C.; Eunice Braga, librarian at the Botanical Garden in Rio de Janeiro; Robert Greenblatt, former employee at the Garden, at the present time attending Michigan State College of Agriculture at East Lansing; J. M. Waterston of the Department of Agriculture, Bermuda; Walter H. Snell, Brown University; Paul Neergaard from Copenhagen, Denmark; Dr. William H. Wigman of New York City; Josiah L. Lowe, College of Forestry, Syracuse; Dr. George B. Cummin, Purdue University; R. B. Thomson, University of Toronto; Ernando Bruno, Assumption College, Windsor, Ontario; Robert Snedigar of the Chicago Zoological park at Brookfield, Ill., and Clifford Proctor, landscapist, from Darbyshire, England, on his way to Seattle.

Groups. Seventy-five members of the Park Association of New York, for which Dr. William J. Robbins serves as horticulturist, made a tour of the Garden Oct. 2. Mrs. Arthur Hays Sulzberger is president and Mrs. Harold Irving Pratt and Mrs. Albert D. Lasker are among the directors.

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NOTICES AND REVIEWS OF RECENT BOOKS

Merrie Little Volume

RECIPES AND REMEDIES OF EARLY ENGLAND. Hal and Violet Trovillion. 76 pages Trovillion Press, Herrin, Ill., 1946. $3

Its choice paper and distinguished type at once individualize this small book, which is the third of a delightful series issued from the Trovillions' private press. Not one of the pages in it is dull reading.

One gets the impression that the Trovillions have selected joyously these old-time recipes, remedies, magic cures, customs and bits of health advice from a wealth of old literature, not always because they savor of the ludicrous, but chosen, rather, for their amusing relevancy to modern living with all its fads and foibles.

For the most part, the original language of the period, Elizabethan or otherwise, is kept throughout the book, though augmented by an irritatingly incomplete glossary.

But the herb enthusiast of today who knows her cooking herbs, will rejoice in the stately phraseology of those recipes for "Seething Benes" (1390) or for the making, in 1682, of the "Queen's Ordinary Bouillon" with mint, parsley, thyme and a "great onion."

As the authors intended to reveal, there is an amazing amount of information in those old recipes of the still-room with its rules for the making of conserves, cooling waters, lotions and love potions. Trivial it may be, but there is something more than absurdity in the excerpts on "The Making of Hysterical Water" and "The Gathering of May Dew."

From treatises on health of centuries ago, are quoted bits of wisdom which might well be followed today.

"Labour not," William Vaughn writes in 1602, "either your minde or body presently after meales; rather sit awhile and discourse upon some pleasant matters."

It is a "merrie" little volume, rather thoughtfully conceived and truly a collector's item. Surely the writers need have no fear that their contribution will not be hailed joyfully by all who respect the wisdom and endeavors of early writings which "hurt no man, but will be pleasantly profitable for all."

HELEN NOYES WEBSTER.

Extolling the Pleasures of Growing Plants Under Glass

GREENHOUSE GARDENING FOR EVERYONE. Ernest Chabot 258 pages, illustrated, indexed. M. Barrows & Co., New York. 1946. $3.

An intriguing, popular little book, this volume is frankly intended to make converts to the fascinating hobby of growing plants under glass. The author, declaring himself relatively a novice, says, "Wouldn't it be fun . . .?"—addressing, of course, the prospective greenhouse gardener.

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It would obviously be unfair to criticize either accuracy or choice of material, though the author's connection with a prominent manufacturing concern makes his equipment details rather the more accurate save for some limitation to their standard practices.

Some interesting experience not elsewhere published is quoted from the author's contacts, and credit is given to numerous specialists and experts, none, however, responsible for the entire text.

Plant lists, calendars and tables, covering alyssum, banana, cauliflower, dianthus, . . . x, y, z, remind one that the flora under glass is unlimited and that such compilations are bound to be incomplete; for example, we miss *Leucocoryne, Lachenalia, Ornithogalum, Clivia, Veltheimia.*

The author recommends "visits to flower shows, botanical gardens, agricultural experiment stations, commercial growers and the greenhouses of others who garden under glass for fun" as "excellent means for education." This is the core of the matter, since the group of greenhouse amateurs is so small that special literature for them is not to be expected, but "gardening is a literary avocation," and libraries should be included in this itinerary.

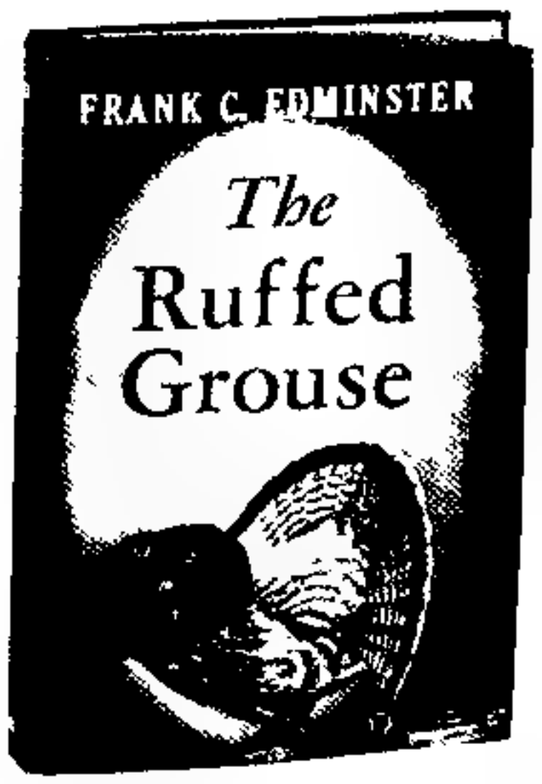
VICTOR GREIFF,
Neponsit, Long Island.

Gleaning Prosperity From Agricultural Waste

NEW RICHES FROM THE SOIL. Wheeler McMillen. 379 pages, indexed. D. Van Nostrand Co., New York, 1946. $3.

"Chemurgy—an idea rather than a science . . . looks for new crops to serve man's expanding wants" — *From the jacket of the book.*

In twenty-three chapters, arranged in three parts, the author, a great crusader, brings to the attention of an indifferent although vitally concerned agricultural world, the truth of an old natural law—"Nothing in nature is lost." "Quite so," says Mr. McMillen, "but you have to seek for nature's values," and he unfolds a thrilling story for everybody on how "chemurgy" has helped to save wastes.



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W. D. TURNER,
Technical Consultant on Plastics.

Lilies, Horticulturally Speaking

GARDEN LILIES. Alan & Esther Macneil. 208 pages, illustrated, indexed. Oxford University Press, New York, 1946. $3.50.

The Macneils have grown lilies successfully for years on their Vermont place. They sell plump, healthy bulbs with good roots on them and the would-be purchaser can depend on their stock, which is unusual among many lily growers. Their book is not only a record of their experience but is up to date on diseases and their prevention, and on the latest methods for propagation by seed and scale, for potting and for exhibiting lilies.

The text is characterized by a refreshing frankness and honesty, such as when they tell the story of *testaceum* and how all bulbs at present available are diseased, as are also some strains of *candidum* and *tigrinum*. The authors are also up to date on the latest hybrids which are valuable for the grower, and they give a list of all lilies being grown in the United States with descriptions of their appearance and cultural notes.

The illustrations are portrait photographs characterized by clarity and faithfulness to the subject. Altogether this is an excellent book for the beginner as well as the experienced grower of this most challenging of flowers, the lily.

HELEN M. FOX

Algae in the Laboratory

PURE CULTURES OF ALGAE. E. G. Pringsheim. 107 pages, illustrated, indexed. Cambridge University Press, Macmillan Co., New York, 1946. $1.75.

This small publication is an abbreviated historical review and critique of the culture methods of the author and other investigators. Since the size of the volume has prevented the inclusion of any quantity of specific data it is regretted that much of the available space has been occupied with discussion of purely routine microbiological techniques and even elementary laboratory methods.

The importance of the use of certified pure cultures in physiological research as a means of reducing the present confusion is suggested. Unfortunately the author has indicated that use of cultures in taxonomic research will yield knowledge of the flora unavailable by detailed examination of the flora. This is disclaimed for their use in ecological research.

The most useful portions of the book will be the last chapter containing data on the culture of various groups of organisms and the exhaustive nine-page bibliography.

HARRY K. PHINNEY,
Chicago Natural History Museum.

Hudson River Background For Some Native Flowers

AMERICAN WILD FLOWERS. Emma C. Embury. 40 pages, illustrated. Hastings House, New York, 1946. $1.

In an earlier volume Mrs. Embury calls the wild flowers "the gems which God's own hand has scattered abroad." This small book has an old-time charm which grips the heart and takes us back to Nature in her most appealing aspect. The Edwin Whitefield drawings are a fitting complement. Each flower is drawn and colored with loving care. And perhaps the crowning delight of this small gem of a book is the series of backgrounds for each drawing, many of them scenes along the Hudson River of a hundred years ago. Mrs. Embury's book will delight nature lovers, calling them again to the woods and fields.

ANNE NICOLL WIGHTMAN, *President, Hudson River Conservation Society, Inc.*

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The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

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JOURNAL

OF

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

EARLY SPRING EVENTS AT THE GARDEN

International Flower Show

Grand Central Palace, New York, March 17-22

The New York Botanical Garden will show a ***Plant Explorer's Jungle Camp,*** equipped with materials used by its staff members on recent expeditions.

Art Exhibit

The exhibit of ***Winslow Homer*** works at the Wildenstein Galleries, 19 East 64th Street, New York City, will continue through March 22.

Members' Days

3:30 p.m. in the Members' Room

March 5	***Nature's Gamble in Producing New Plant Forms***	*A. B. Stout*
April 2	***Vacations Without Hayfever***	*Roger P. Wodehouse*

Saturday Afternoon Programs

3 p.m. in the Lecture Hall in the Museum Building

March 1	***Spring Flowers in Crete***	*Professor and Mrs. Clarence H. Young*
March 8	***Rock Garden Construction***	*A. C. Pfander*
March 15	***Exploring in Tropical America***	*G. H. H. Tate*
March 22	***"While the Earth Remaineth"***	*Frank E. Gunnell*
	A prize-winning motion picture with musical background.	
March 29	***Gardening in Great Britain Today***	*Elizabeth Hess*
April 6	***Two motion pictures on Vegetable Gardening,*** from the U. S. Department of Agriculture	
April 13	***Planting About the House***	*Ruth N. Wetzel*
April 20	***Primroses You Can Easily Grow***	*Aleita H. Scott*

Radio Programs

Alternate Wednesdays at 5:45 p.m. over WNYC (830 on the dial)

March 5	***Starting a Garden of Herbs***	*Mrs. Oliver B. Capen*
March 19	***Exploring in Nyasaland***	*Harold E. Anthony*
April 2	***New Beauty in the Garden with Delphiniums***	*Edward Steichen*
April 16	***Vegetable Gardening Must Go On!***	*Walter Zulch*

Courses

March 1	***Plant Propagation*** 4 alternate Saturdays, 2-4 p.m.	E E. Naylor, Instructor $5
April 14	***Botany for Beginners*** 6 Mondays, 3-4 p.m.	E. E. Naylor, Instructor $5
April 19	***Field Botany*** 15 Saturdays, 1:30-3 p m.	G. L. Wittrock, Instructor $5 ($2.50 to teachers)

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Exploring for Useful Plants

A Glance At The Fertile Past And Into The Promising Future

By David Fairchild

I KNOW that the general idea of exploring is to go to places where nobody else has been and find something which nobody else has seen. My own experiences in this field of exploration do not accord with this general conception.

To explore, one should begin in one's own back yard, if one has such a thing. If one hasn't any, then in a neighbor's yard. Get a microscope, a hand lens, and turn over all the old boards in the yard and examine the angleworms and the eelworms and the sow bugs which crawl out when you turn them over. Pull up the weeds and see what their roots are like, and if you are not afraid, taste them carefully, expecting to have your tongue burn a bit sometimes. When the weeds seed, find out how they scatter their seeds and how they lose their leaves and ask someone why the leaves fall and whether they have any vitamins in them, and pile them up and make a compost out of them in which you will find all sorts of strange mushrooms, including microscopic ones of the greatest beauty of form and color.

Carry on this exploration of your back yard until you can find nothing unknown in it, and then begin to read about the vast outside world which touches your back yard at every edge of it—and discover that you have overlooked a thousand things in the yard which in your ignorance you brushed aside.

If you have the stuff in you to become fascinated by your own back yard you are on the way to getting ready to be a real explorer of the back yard of the tropical or any other world anywhere on the planet.

Until you know a lot about the place you live in, you are not prepared to go out and find things that are new. I have had the experience of

"I TRUST some little boy may take to heart what I say about his own back yard," wrote David Fairchild, veteran explorer of the United States Department of Agriculture, when he returned final proof of the article he wrote for this number of the Journal. At his home, The Kampong, at Coconut Grove, Florida, there is visible evidence of some of the thousands of plants which he has brought back from distant countries—plants which will give food, oil, wax, fiber, and other products, as well as beauty. Yet, Dr. Fairchild and others of his generation have only scratched the surface of potential search for useful plants. "The jungles of the world," he asserts in conclusion, "are open to exploration as they have never been before."

getting seeds in Africa which I thought would be valuable in Florida, to find later that the plant was already growing in the swamps of the Everglades without my having noticed it.

What Comes of Exploring?

What is the value of exploring? What comes out of all this wandering through the forests of the world, spying out plants and putting them between newspapers and bringing them home to press and dry and mount on white paper?

I will tell you, and I have not been that kind of an explorer either. I have gone out hunting for seeds; things which will grow and bloom and fruit and perhaps shade someone with their leaves or thrill someone by their flowers. But the explorers after the specimens which fill the great museums of the world are doing something fundamental; something without which a chaos of names results, and the confusion prevents our progress to a most amazing extent.

Try to make a common-name index of the things in your own room or in your back yard and then let some friend try to use it and discover, which he will very soon, that he has no idea under what letter to look for a book or a bug in the garden or the vine which is on the garden wall. You will understand that you live in a chaos of sorts. But imagine yourself transported to the shades of some tropical jungle where there is not a single thing about you which you can find a name for. Then you will appreciate what it means to have had someone like a Humboldt or an Asa Gray or a Rumphius or a Standley or a Britton spend thousands of hours poring over dried specimens gathered in that jungle, or one like it, and arranging the specimens in a kind of order to which he furnishes the keys. If you want to find a friend in the mazes of New York streets you

look for his name in the Telephone Directory and talk to him. If you want to find a plant you have heard about somewhere in the wilds of West Africa you get a Flora of that vast region and find a page devoted to it and giving the exact name of the spot where it was seen. So sure could you be that that spot is the one to go to that you could charter a plane to fly there and hunt for it. Perhaps the plant explorer who first saw it there has been in his grave a hundred years, but you can depend upon it, that was the spot where the plant was seen growing when he plucked the branch or flowers which rest in the herbarium of some museum, where the same explorer or another one perhaps had seen it and examined it with his hand lens.

But you still ask, "What was the use of the plant from West Africa after the explorer got it?"—the seeds of it, I mean.

So circumscribed are the most of us who live among the tall buildings of great cities that although we see the skyscrapers clearly, we seldom stop to wonder what the millions of human beings who made them and live in them are fed, and how these things they eat have come to their tables—from where and when.

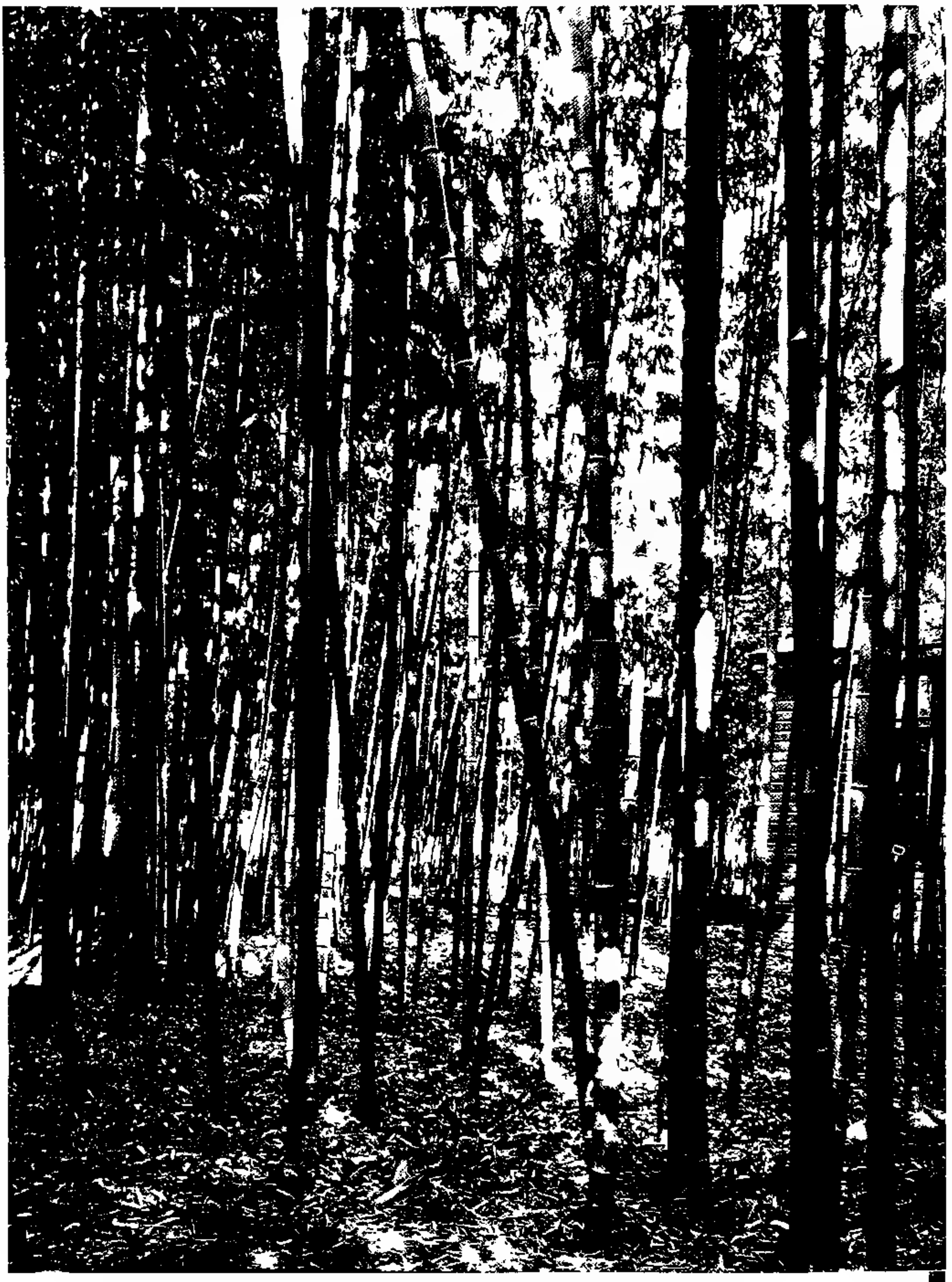
New, Useful Plants for America

This is not the place to expand the stories of the potato, the corn, the tomato, the sweet potato, the barley, the cucumber, the spinach or any of the fruits which adorn our tables. I have a much simpler theme; one that is limited to the coming to America of a number of useful plants in my own lifetime; plants with which I have had something to do, either directly or through other explorers of one sort or another who lie today in their graves, most of them unhonored in the main by a public to whom only the spectacular warriors or politicians make appeal.

As I write, there face me twenty volumes of records of their activities and explorations where are written, as they wrote them, accounts of the finding of more than 150,000 economic food plants, their varieties, their native names, and their uses. These accounts were all accompanied by the living seeds with which here in America experiments were made to see if they would accommodate themselves to the climate and soil conditions of any part of the United States. This is a long story and a continued one, for the agricultural and botanical explorers are still going out in search of seeds and specimens.

What I am asked to tell is of some of the successes and what they have meant in the terms of the man on the street who thinks in dollars and cents; to whom the value of the shade tree over his door does not count so much as does some plant which will perhaps shorten his grocery bill.

When the stream of agricultural explorers started out in 1898 and there gathered about me men who knew intimately what was growing in their back yards or in their broad Kansas pastures and grain fields, the bread



"Then there is the whole question of the giant grasses, the bamboos. . . ." Here planting *of timber bamboo, Phyllostachys bambusoides, one of 120 bamboo species bei* tested *at the Barbour Lathrop Plant Introduction Garden of the Bureau of Pla* Industry, *near Savannah, Georgia.*

everybody ate was made of soft wheat and was brilliant white and had little of the superior quality of the long loaves of French bread. The macaroni wheats that Carleton searched for in the Russian Ukraine and the Black Lands of Russia led to a kind of revolution not only in the macaroni industry, which was then in its infancy here, but in the bread-making of the whole country.

Date Palms and Tung Oil

There were only a few scattered seedling date palms in the then uninhabited deserts of southern California and Arizona where today there are 50-foot-tall date palms whose load of fruit requires mechanical derricks to enable the pickers to gather the dates when they ripen. Almost a half of W. T. Swingle's life work went to the studies of the date palm in Algeria and its requirements. The names of half a dozen plant explorers are clustered about him, and the records of Silas Mason, T. H. Kearney, and the writer of this account are to be found in the volumes on my shelf here. Who will know or care a whit, when he eats the delicious California dates, who brought them in; what exploration of this kind entailed; what pages upon pages of names were required to prevent a chaos and a silly popularization of names which takes no account of the striking Arabic names of the date varieties in the oases of Arabia and Tunis and Algeria and Egypt?

The Chinese junks that I first saw on the Yangtse Kiang in 1902 were all painted with "wood oil," Chinese wood oil, or tung oil, as it is variously named. My associates, Dorsett and Bissett and Morrow and a dear old ship's carpenter at Tallahassee by the name of Raines, and a Scotsman by the name of Ronald were given the pleasure of first playing with this Chinese tree in America and starting an industry which this year is yielding but $11,000,000 to the hundreds of tung oil growers. These were all exploring in a field new to this country; finding out how to grow this new strange tree.

The Start of the Soybean Industry

One of the early explorers whose name has been almost forgotten was Professor Georgeson who was called to Japan in those early days when the Japanese admired the research stations which had been started in this country and wanted to copy them. He was of the exploring nature I have indicated and when he found himself surrounded by a people who never drank milk nor ate beef steaks and yet were strong and healthy, he studied their foods, tasted them, and discovered they were as sustaining as those he had known in Denmark and in this country. He came to like their TOFU and their soy sauce and the freshly boiled soybeans which were served in the pod and eaten with soy. "Why cannot we grow this bean in Kansas?" he had asked. He brought soybean seeds back and tried them, but for

some reason they grew indifferently—not at all as they had in Japan. Some wise ones declared that the soybean was not adapted to the climate and soil conditions in America and most people believed this.

My old friend Merton B. Waite, whose mind was as truly of the exploring type as though he had spent his life, like Alfred Russel Wallace, in the jungles of the world instead of among the pear orchards of this country, discovering how the bees carry the pear blight germ from tree to tree when they visit the flowers, had tried to grow the soybean in his orchard in Maryland. The beans grew very indifferently. This was in 1897. We discussed the reason and came to the conclusion that perhaps the roots of the soybean needed a specific bacterium in the soil around it and that Maryland soil didn't have this soil germ. So together we tried an experiment. I sent and got from a soybean field near Tokyo a bag of soil and with it we carried out a plot experiment. Rows of soybeans were planted in the Tokyo soil alongside beans from the same lot not far away in Maryland soil. The Tokyo soil plants grew amazingly, far outstripping those in the Maryland soil, and when autumn came we dug up some plants and photographed their roots. Those of the Tokyo soil rows were covered with nodules, whereas those of the Maryland soil had almost none. One of my prized photographic "pin-ups" is this photograph which Waite took. In the years that followed, Agricultural Explorers from the little Division of Plant Introduction of the Department of Agriculture ransacked the back yard gardens and the fields of China and Manchuria and Japan for varieties of the soybean, and more than a thousand different sorts were secured which went into the building up of the then new soybean industry. Now it is a thing of millions of acres, immense storage and processing plants, and milling enterprises which are scattered over half a dozen states. And the soybean fields are still spreading.

It was a little band of true explorers who, with the curiosity born of having studied every detail their eyes fell upon in the back yards of the homes they lived in, searched for soybeans everywhere. Their names should not be forgotten in the haste to generalize. Dorsett and Piper and Frank Meyer and Pieters have passed on into the shades; but Morse is still with us and is today honored—and deservedly so—as the center of a group which stirred up the farmers to an appreciation of the vast possibilities of this Oriental crop—a crop which in the Orient takes the place of the dairy industry of the Western World—and furnished the seeds for thousands of trials.

A Vision of Future Plant Exploration

I could go on with the story far into the night, but there is a limit and I must close with a personal vision—take it for what it is worth—of the vast possibilities for plant exploration which the airplanes and quick trans-

"Even the best varieties of the peach palm seem never to have been investigated." Guilielma, because of its abundant, tasteful drupes, ranks as one of the important fruit-producing palms of tropical America. Yet it is virtually unknown outside of the lands where it is native.

port of seeds and the developing of tropical agriculture have in store for the boys and girls who have explored their back yards and want to see the world with seeing eyes.

There are the vitamin-rich fruits and vegetables which man has just begun to learn the existence of. The Barbados cherry which I have growing here on The Kampong has, just before it ripens, more than 4000 units of ascorbic acid, and it makes a superb jelly. The Javanese—and there are 40 millions—eat in their diet so many green vegetables that Professor Ochse has written a book describing more than 300 of these, most of them unknown to people of the Western World, and as yet unanalyzed. The peoples of the great Amazon valley have species of palms that have never been studied by scientific men, of which they consume enormous quantities. Even the best varieties of the peach palm seem never to have been investigated.

The whole world of trees suited for growing in forests for timber, which the explorers like Foxworthy and Curran have spent their lives studying in the jungles of Malaya and the Philippines and which the older forester Koorders of Java tried to classify, remain to be grown in great forest preserves on the slopes of the tropical mountains and in the swamps along the waterways.

Then there is the whole question of the giant grasses, the bamboos, of which there are hundreds of species scattered through the temperate and the tropical lowlands and mountain slopes of both hemispheres. Those visitors to Florida who motor in haste by our collection of 120 kinds at the Barbour Lathrop Plant Introduction Garden 13 miles south of Savannah, Georgia, miss one of the most striking plant sights of eastern North America. The names of Barbour Lathrop, Frank N. Meyer, E. A. McIlhenny, D. F. McClure, Robert A. Young, and David Bissett—explorers, all of them, of the kind I am talking about—will live in the history of bamboo culture wherever it takes root in a big way and the problem of its use for paper pulp is worked out. Then the exhaustive exploring journeys of McClure up the rivers of China will be interesting reading indeed.

As I write these words I look out and see still stretching skyward the 60-foot shoot of a South American bamboo. It points and beckons and reminds me that although in the early forties, a century ago, Richard Schomburgk described a bamboo which the Indians of the Guianas make their blowguns out of and which has slender stems without a joint for 15 feet, nowhere has it been brought into cultivation by civilized man. I have tried to get it repeatedly, but so far in vain. It is *Arundinaria Schomburgkii,* the CURATA of the Macusis. I mention this to indicate that the work for botanical explorers has barely begun.

It is when we approach the subject of the relatives of those plants upon

which we depend for our essential foods that we find a vast category of wild species whose hereditary genes are utterly unknown to the students of genetics; those who are pushing their explorations into the very structure of the cells out of which, through multiplication, are built the things we eat or admire. This world is, after all, the great new world of exploration into which modern botany is sure to go, and the jungles of the world are open to exploration now as they never have been before.

Medicine and Plant Exploration

By Ralph Holt Cheney, Brooklyn College,*
And Benjamin L. Milana, Brooklyn College of Pharmacy

AMONG the dozen most important drugs employed in modern medicine, more than half of them are derived from plant sources. In addition, the keys to a large number of the synthetic compounds used therapeutically were discovered by a study of the plant principles produced by natural metabolism.

The pharmacopoeias of the world vary from a few pages with less than 100 botanic drugs listed to the Chinese pharmacopoeia of several volumes including hundreds of plant species. The history of botany, pharmacy and medicine reveals that the sources and uses of these drugs have been discovered in many interesting ways—often, as stories about such drugs as digitalis, quinine, cocaine, strychnine, curare, ouabain and strophanthin reveal, accomplished by dramatic experiences. Some medicines were an incidental by-product of expeditions for conquest, colonization, or religious conversion. Others were the direct result of the activity of botanists or physicians—or both—assigned for the specific purpose of plant investigation as a part of a general expedition, or a group organized especially for plant exploration.

Incentive for a Russian Botanical Garden

There has been one instance, at least, in which an interest in medicinal plants actually preceded plant exploration rather than the reverse. In 1714, Peter the Great of Russia ordered a medicinal plant garden to be laid out in one of the islands of the Neva river. It was called the Apothecaries' Garden and the island is still referred to as Apothecaries'

* Dr. Cheney is also Resident Investigator for Economic Plants at the Brooklyn Botanic Garden.

Island. In 1716, Peter the Great visited the botanist Breynius in Danzig and requested him to recommend a botanist to explore the natural productions of Russia. Breynius proposed Messerschmidt, who traveled from 1720 to 1727 in Siberia and made vast collections, especially in the eastern region, of reputedly medicinal and other plants. Upon the order of Alexander I, this Apothecaries' Garden in 1823 became the Imperial Botanic Garden under the directorship of Friedrich Fischer, who is regarded as the founder of the Botanical Garden of St. Petersburg, now Leningrad.

Bitter-wood, Sassafras, and Rhatany

The plant journeys of individual botanists have been responsible for many of the drug plants cited in the official list recognized by the United States Pharmacopoeia XII (known as "U.S.P.") and in the National Formulary ("N.F.") VII, which are the current authoritative volumes published in the United States. For example, bitter-wood (*Picrasma excelsa* and *Quassia amara,* both of the Simarubaceae or Ailanthus family) is a bitter tonic and pinworm remedy in the form of an enema. It was introduced originally into Europe by the botanist Dahlberg, a pupil of Linnaeus. Occasionally a general explorer and plant collector has introduced a species of some medicinal significance. In 1602, Bartholomew Gosnold commanded the expedition ship *Concord* chartered by Sir Walter Raleigh. He sailed along the coast of New England and carried what must have been the "first export cargo from Massachusetts to England" in the form of ague-tree bark (*Sassafras albidum* of the Lauraceae). This perspiration-inducing agent was used by Seminole Indians in Florida before the adventure of Ponce de Leon in 1502. This plant is also the source of one of the chief aromatics in such popular soft drinks as root beer, birch beer, and sarsaparilla. Peruvian rhatany (the root of *Kramcria triandra* of the Leguminosae) was introduced into Spain by the botanist Hipolito Ruiz. During his travels in Peru, he observed native women using it as an astringent and tooth preservative. A similar and also official species, *Kramcria argentea,* now comes from Brazil.

Often, an all-purpose governmental expedition has included one or more botanists for plant exploration. In 1852, the United States sent two naval expeditions to eastern Asia. The first was commanded by Commodore Perry and had aboard Dr. Wells Williams and such other plant collectors as the American surgeon, Charles Frederick Fahs, Daniel S. Green and James Morrow. Their collections were identified by Dr. Brott, Daniel E. Eaton, W. G. Sullivant and Dr. W. Harvey. The second expedition took along the botanist Charles Wright. These explorations, and also such travels as Robert Fortune's journeys in China, re-introduced for further studies such known medicinal plants as species of *Rhamnus* (cascara) and *Aconitum autumnale* and *A. chinense.*

The botanico-pharmacognostic exploration undertaken by Dr. H. H. Rusby, for 42 years Honorary Curator of Economic Collections at the New York Botanical Garden, and by others for Parke, Davis and Co., in 1885, led to the discovery in South America of an abundant supply of *Rhamnus Purshiana* which yields the official cascara sagrada. According to tradition, cascara bark was known to the early Spanish priests of California. It was introduced into general use in 1877 and has been a favorite tonic laxative all over the world ever since. Dr. Rusby's trip also led to the discovery and collection along the Mapiri river (Andean slope of Bolivia) of cocillana (the bark of *Guarea Rusbyi* of the Meliaceae or Mahogany family) used by the natives as an emetic and introduced into U. S. medicine in 1886 as a nauseant expectorant, similar to ipecac. It is no longer officially recognized in either the U.S.P. or the N.F. but is advertised widely today as an ingredient in certain cough drops.

There are at least 35 or 40 minor drugs obtained from plants with which our ancestors became familiar through their contacts with the North American Indians. These drugs, however, can not be said to have been introduced as a direct result of plant exploration, although our colonial botanists and physicians were always on the outlook for the native plants possessing medicinal value.

The Search for a Cure for Leprosy

More ancient than the Bible is the dread disease of leprosy. Prescriptions for its treatment are known in the Egyptian records in 1500 B.C. In the middle of the 19th century, British doctors in India became aware that the Burmese and Bengalese used the seeds of an unknown tree which had some really beneficial effect in the treatment of leprosy. Seeds were obtained and their oils and acids studied by the Wellcome Research Laboratory in London and by Frederick Power of the United States Department of Agriculture. Dr. Dean and his associates in the leper receiving stations in Honolulu and Molokai used the oils with apparent success. The question was imperative. What tree of the jungles bore these seeds? The markets of Benares and Rangoon obtained chaulmoogra or kalaw seeds from the tribesmen of the upper Chindwin district of northeastern Burma.

In 1920, the U. S. Office of Foreign Seed and Plant Introduction sent out the Agricultural Explorer, Joseph F. Rock. In Bangkok, the capital of Thailand (Siam), Rock found an avenue of *Hydnocarpus* trees which the natives called MAIKRABAO. These trees possessed oils similar to the chaulmoogra. At the suggestion of Princess Bovaradej of Siam, with whom he was dining, Rock found abundant *Hydnocarpus* near Korat in eastern Thailand. Later, Rock found the true chaulmoogra tree, *Taraktogenos Kurzii* near Kyokta village in the Chindwin district of Burma. Although some patients react anaphylactically to intravenous injections of

chaulmoogra and some patients are said not to remain cured; others, who are qualified to speak, deny this claim of the temporary nature of the effect. Although some leprologists have dropped the traditional chaulmoogra oil treatment as worthless, there is much evidence that it is beneficial. The oil is also used for other purposes and the trees are now grown by the United States in Hawaii, the Philippines and in Florida.

Quinine in the Recent World War

In 1942, when the quinine source of the world was suddenly cut off by the invasion of the Dutch East Indies by the Japanese, the U. S. Board of Economic Warfare (now the Office of Foreign Economics Administration) undertook negotiations to buy all the *Cinchona* bark above a certain minimum alkaloidal content, from the Andean Republics which were the world's quinine source a century earlier. The Cinchona Missions in South America were organized. American botanists, including W. C. Steere, F. R. Fosberg, W. H. Camp, and others, relocated and identified the several species in the forests of northwestern South America. These species included the lesser known *C. pitayensis* which is unusually rich in alkaloids for a wild type *Cinchona*. It averages 3% and ranges up to over 5% in total alkaloids. Chemists analyzed the barks in the Cinchona Mission Laboratories which were operated in Bogotá, Quito, Lima, and La Paz.

This official botanical exploration resulted also in the revival of the use of the quininiferous bark known as "cuprea bark" from *Remijia pedunculata* as a source of the medicinal quinine. This species was re-discovered on the west slopes of the eastern Andes, north of Bucaramanga. Its bark yields up to 3% quinine sulphate and with very little admixture of other alkaloids. This bark has been known for its quininiferous content for many years, according to the Flückiger account of shipments of over 3,000 tons of cuprea bark (*Remijia*) to London in 1881. Therefore, although it was not a species new to science, the availability of this most important malaria-control drug during the emergency period of World War II was made possible through the direct efforts for this purpose of plant exploration conducted by the U. S. government. Resulting analyses have brought to light some significant physiological distinctions between botanical species, varieties and forms not previously suspected.

More Exploration Needed in Interest of Human Health

Constant support of future plant explorations should be encouraged under public and private auspices interested in the therapeutically active principles produced by the metabolism of vegetation. History indicates that such investigations would result undoubtedly in the discovery of some new drugs and in the selection of more efficacious homologues of known drugs for the alleviation of human disease.

Plant Explorers, Nurserymen And Breeders

By John C. Wister, Swarthmore College

IN THE EYES of the enterprising gardener, the nurseryman and plant breeder play roles quite as important as the explorer. Yet the explorer must come first to give them the materials with which to work. Dr. Wister here portrays the interdependence of these two or three (breeder and nurseryman often being the same) and reveals their joint effect on today's and tomorrow's horticulture.

IF we look at a garden of annuals, perennials or shrubs with a thought for the geographical origins of the plants, we find that a large majority —perhaps 65 percent—come from other continents. Many of our flowers grown as annuals, such as nasturtiums, petunias, verbenas, once grew wild in South America. A number of our perennials—the old fashioned gas-plant, sweet-william, Canterbury bells, and others—are natives of central Europe and the Mediterranean region, including Asia Minor. Many of the shrubs that are grown in eastern United States came from eastern Asia, for plants from that section of the world thrive particularly well along our eastern seaboard.

Many books and articles have been written about the work of men who have gone to distant countries and brought back plants, but as yet there is no comprehensive history about them. Neither is there much information about the men who have improved the newly discovered plants and made them available to horticulture.[1]

The work of plant explorers embraces many different periods. The early introduction of plants from southern Europe and Asia Minor into England included most of the common fruits, such as apples, pears, and peaches, which had come to these regions originally from China.

[1] Dr. John M. Fogg, Professor of Botany at the University of Pennsylvania, has given a lecture course at the Arboretum of the Barnes Foundation in Merion, Pa., about early botanists and explorers and it is to be hoped some day this will be published in book form. It is, however, concerned primarily if not entirely with technical botanists and their work in finding and naming plants. When first given the course did not include many references to persons who introduced plants from the wilds into gardens, which is a different thing from identifying wild plants and merely collecting herbarium material.

In due time the British obtained plants from North America, during a period typified by the work of the clergyman, John Banister,[2] as early as 1680, and by John Bartram who sent plants abroad to Peter Collinson in the 18th century. Then there were the other explorers such as Michaux, the Frenchman, who came to this country primarily to collect living plants to send to Europe. Later from England came John Fraser and John Lyon. During the early 19th century Americans like Pike, Long, Torrey and Pursh, Hosack and others were gathering plants from the wild or establishing gardens for the cultivation of both native and exotic materials.

Meanwhile there came the great period of exploration for plants in China, beginning with d'Incarville, who sent the ailanthus to France about 1751. He was followed by von Seibold, Macartney, Kerr, Fortune, Thunberg, Kaempfer, Maximowicz, and Veitch's twenty-two explorers, culminating in E. H. Wilson. There were also the French Jesuits—David, Delavay, Soulié, Farges, Bodinier, and Giraldi and many others. There were the Americans, George R. Hall, Thomas Hogg, William Clark Smith, and others, and the Irishman Augustine Henry.

All these men did important work, many of them under the sponsorship of great institutions such as Kew Gardens, the Paris Museum of Natural History, the great Veitch Nursery, and, in this country, the Arnold Arboretum. The New York Botanical Garden had not yet been established when most of these explorers were in the field.

I have mentioned China particularly because it is from there we have drawn so many trees and shrubs which are hardy in the climate of eastern North America. A similar list of plant explorers could be named from Africa, Australia, India, South America, and other regions. It is to them that we owe our greenhouse plants and many annuals of our gardens.

To the botanist it is sufficient to have a good botanical specimen in the herbarium, but the gardener wants much more: he wants the living plant, and not merely a typical representative of the species, but if possible a variety or form, which for gardening purposes may be an improvement on the type.

A signal example of what sometimes happens in plant introduction can be observed in the early history of *Buddleia*, the butterfly-bush:

> Linnaeus named the genus in 1737. I have read that the French Jesuit, Armand David, discovered a species of *Buddleia* in China and introduced it to the Paris Museum in 1869, but I have also seen this date given as 1890. Other accounts say that Augustine Henry discovered it and introduced it to the St. Petersburg Botanical Garden. Whatever the source, this was the species which Franchet in 1887 named *Buddleia Davidi* and which Hemsley in 1889 named *Buddleia variabilis;* this latter name was in common use until recent years when the priority of the name *Davidi* was established.

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[2] John Banister (1650-1692) settled in Virginia after living for a while in the West Indies, and from there he sent plants back to his native England.

The old-fashioned gas-plant (above) comes from the Mediterranean region; deutzia (left), one of our commonest springtime shrubs, from Asia; and the bright-colored nasturtium (right) from South America. These are among the estimated 65 percent of our garden flowers that are native on other continents.

This is the sort of information about a species in which the botanist is interested. The horticulturist, on the other hand, is concerned with *when* the first *Buddleia* was introduced into gardens. He notes that it was a decidedly inferior form which made no impression on gardeners. To the horticulturist, therefore, it is of greater interest to know that in 1893 the firm of Vilmorin, Andrieux & Co. of Paris received seeds of a better form from the French explorer, Jean André Soulié. I have not been able to find a record of what happened to these plants, but about 1903, Wilson introduced from China a similar form through the English nurseryman Veitch, and it was called at that time *Buddleia variabilis Veitchiana*. It was different from the forms *magnifica* and *Wilsoni*, which Wilson had also introduced through Veitch. All of these were named by him in 1905, and they established *Buddleia* as a garden favorite. Gardeners, therefore, really credit this plant to Wilson rather than to David or Henry.

Since the time when Veitch introduced plants brought in by Wilson, at least seven nurserymen have raised seedlings and developed and named the varieties which we are growing today. These seedlings now have a much greater color range than the

wild types, occurring in white, pinkish-lilac, orchid-pink, blue-purple, and deep red-purple. We have, therefore, as a history of *Buddleia,* a sequence comprising the original discovery, the original introduction which had no value, a secondary introduction of great value, and then, finally, the work of the nurseryman in giving us fine colors. In this group, at least, there is no record that any of these are hybrids with other species.

I have dwelt at length on this particular group because it typifies the differences between botanical and horticultural exploration and also shows the importance of the nurseryman and the plant breeder. Another example is that of the lilac, *Syringa oblata,* and its varieties:

This species was introduced by Fortune from a Chinese garden in 1856 and was named by Lindley in 1859. Lemoine crossed it with *S. vulgaris* and in 1878 named the resulting hybrid "Hyacinthiflora plena." It was a rather insignificant plant which made no great impression, but upon it Rehder in 1899 founded the hybrid species *S. hyacinthiflora.*

The variety *S. oblata Giraldi* was introduced from north China in 1895 as probably the wild form of the type. Lemoine crossed this with *S. vulgaris* and introduced the variety "Lamartine" in 1911 and other similar varieties in the twenty years following. These varieties were totally unlike "Hyacinthiflora" but according to botanical rules are classified under it. They are extremely valuable contributions to horticulture even though they have no distinct botanical standing.

In 1917 E. H. Wilson introduced from Korea *Syringa oblata dilatata.* This is a much finer plant for the garden than its two predecessors. F. L. Skinner of Manitoba has crossed this with *S. vulgaris* and is now introducing forms quite distinct from either the original "Hyacinthiflora" or from the "Lamartine" group. Some of these new forms may turn out to be better than any varieties we have had before. They really constitute a new race, yet they must bear the accepted botanical name *Syringa hyacinthiflora.*

It has seemed to me important that records should be kept of the introductions of such new improved forms in order that sometime in the future more comprehensive histories of plant exploration might be written. We know now, through general books, the names of most of the great botanists of the past and we know many of the plants which they introduced, but there are often inadequate records of the exact places from which the original type of the species was collected.[3]

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[3] It is only a few years ago, for instance, that through the auspices of the John Bartram Association, Dr. Francis Harper made a thorough study of the writings of John and William Bartram and went carefully over the ground which these men had covered so many years before. His publication of notes on these two pioneers has given us a much better comprehension of their work. Similar work needs to be done about the work and the travels of many other early botanists. How much it would involve can be seen from the work of Dr. John Hendley Barnhart over many years in compiling at the New York Botanical Garden a great card catalog of botanists with some brief information about them. In later years Dr. Barnhart added many horticulturists to it, though often only by name as so little information was available about them. I feel personally greatly indebted to Dr. Barnhart because I have often had the privilege of consulting this card catalog and getting my first real information about some person whom I knew only by last name.

Buddleia, which has become a summer-flowering garden favorite, owes its position in American horticulture to a combination of plant explorers and nurserymen, all attempting to discover or develop finer forms.

There are many plants in our gardens today descended from first introductions. Yet, in the wild, waiting for further explorers, there may be superior forms of these species which might give much better seedlings. Some of the botanical explorers, of course, have kept their eyes open for superior forms, but that is not their chief function. Nor is it the primary function of botanical gardens to encourage exploration to find these, but it should be the function of our horticultural societies to do this work which is pre-eminently in their field.

When new plants have come in to the institutions which have been mentioned, some of them might have remained scientific curiosities but for the interest of nurserymen, florists, and amateur gardeners who wished to use them on their places. The great European nursery firms of the 19th century[4] were largely responsible for propagating the new material, selecting better forms, and sending them out to gardeners.

In America William Prince (1725-1802) was one of the first of the great nurserymen, bringing to this country and distributing many of the plants that we still enjoy today. In the 19th century he was followed by a remarkable group of growers of whom we nowadays know only a few, such as Ellwanger and Barry, Landreth, Parsons, Hovey, Moon and Hoopes.[5]

These old-time nurseries grew many kinds of ornamental plants but their great specialties were fruit trees, particularly apples and pears, many of them having hundreds of varieties of each. This phase of American horticultural history is now familiar only to students, for it came to an end when better transportation and refrigerator cars made it possible for fruit to be shipped long distances.

Present economic conditions and high cost of labor make it more and more necessary for nurseries to use mass production of rather few kinds instead of growing a big assortment. This, in one way, is a great loss to horticulture; in another way it actually forces the nurseries to grow the finest kinds and not put out the mediocre sorts. We still have today a great variety of plants from which to choose and more varieties are grown than most gardeners can properly learn to care for. It should, however, be an important function of botanical and horticultural leaders, groups, and societies to foster further exploration for plants in all parts of the world, not so much with the hope of getting new species, but to get superior forms of already known species from which the plant breeders can give us new varieties of great value.

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[4] Veitch in England, van Houtte in Belgium, Croux, Moser, Vilmorin and many others in France, Ludwig Spaeth and Pfitzer in Germany, Froebel in Switzerland, Koster, den Ouden and other famous nurseries of Boskoop, Holland, and the great Dutch bulb firms of Krelage, de Graaf, van Tubergen, van Waveren, and so forth.

[5] Many of the catalogs of these early nurserymen are on file in the library of the New York Botanical Garden, the Massachusetts Horticultural Society, and the United States Department of Agriculture in Washington, and they give exceedingly long lists of plants which in those days of cheap labor could be grown and sold at very low prices, yet at a profit. I have seen century-old bills of some of these nurseries which were selling Cedar of Lebanon at 25 cents a plant (the size not stated).

The Waiting Forest Resources Of The American Tropics

By Arthur Koehler

THAT there is a scarcity of high-grade native hardwood lumber in the United States can be attested by anyone who even before the war tried to buy large quantities of clear wide boards or veneer of oak, maple, birch, and walnut. Due to the extensive cutting of choice trees of such species during the war and heavy subsequent civilian demand, the acuteness of the shortages has become still more evident.

That there are extensive forests in the countries to the south of the U.S.A. has been so well established that it can be said to be common knowledge. To be more specific, it is estimated that there are 2,172 million acres of forest land in the Latin-American countries as compared with 620 million acres, all told, in the United States, although a considerable portion of the forest areas in both continents are poorly stocked with timber. Furthermore, only about 6 percent of the forest land in Latin America is stocked with softwoods (conifers), the great bulk of the timber being hardwood, whereas in the United States about 85 percent of the forest stand is in softwoods.

That there is a large dollar-and-cents interest in the utilization of Tropical-American species of wood at the present time is shown by the numerous inquiries about the occurrence, characteristics, identification, and possible uses of tropical woods received at the Forest Products Laboratory since the end of the war. The inquiries come from timber owners, exploiters, merchants, and prospective users.

So, here are potential demand, supply, and capital ready to go. Can anything prevent the importation of lumber and veneer logs on a large scale from Mexico, Central America, the West Indies, and South America within a few years? Perhaps the most effective hindrance to going ahead, full steam, will be the element of risk.

Let us analyze the situation by working backward, beginning with the ultimate consumer, because after all, the consumer is the person who determines whether a new product or a new wood is going to make a hit. Suppose a manufacturer advertises modern furniture made of "caxinduba" wood. The consumer can see what it *looks* like (unless it is painted or heavily stained), but will he be satisfied by appearances? No, he will want to know how it stands up in use. How hard and strong is it? Is the wood apt to warp? Will it fade or darken with age? What well-known native species is it like in behavior? Unless the salesman can *assure* him somehow

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Mr. Koehler is Chief of the Division of Silvicultural Relations, in the Forest Products Laboratory, maintained by the Forest Service, U. S. Department of Agriculture, at Madison, Wisc., in co-operation with the University of Wisconsin.

that the wood is "as good as it looks," the customer will prefer to let someone else experiment with it first.

Now let us step back to the manufacturer who is offered a shipment of "caximduba" lumber at a price he is willing to pay, if . . . But first he wants to know how does the wood season? Will it check, warp, or collapse badly in kiln drying? Will it dry in a reasonable length of time? Does it shrink and swell badly with such changes in moisture content as occur with changes in the seasons? Can it be surfaced and glued without difficulties? Does it perhaps dull saws and knives quickly, as indeed is the case with some species of wood that are not at all very hard? When it comes to finishing, is there perhaps some natural oil or soluble gum in the wood which may cause trouble when finishes are applied, or several months later? In addition, he wants to know the answer to all the questions the consumer may ask. If the answers seem to be favorable, then he wants to know if he can be assured of a continuous supply.

Similarly, the wholesaler does not want to load himself or his customers with lumber or veneer of unknown quality. And finally, there is the man who buys the standing timber, whether by the thousand board feet or acre, and the banker who finances him. They do not want to invest their money in logging equipment, sawmills, veneer plants, dry kilns, only to find out that a large percentage of the timber has some "bug," not necessarily an insect, in it.

To give just a few examples of difficulties encountered in exploiting inadequately known woods: There is a species of timber in Central America and northern South America which grows to large size, and at times yields up to 5,000 board feet per acre. The wood is rather light and easily worked, shrinks and warps relatively little, and is said to be resistant to fungi and to insect attack. It is an excellent wood for cores for veneer panels, drawer sides and bottoms, shelving, light boxes, and many uses where a high degree of strength and hardness are not required. It has one serious drawback, however; it hangs on to its moisture tenaciously, being unconscionably slow to dry, and if the drying is forced in a dry kiln, it collapses to useless proportions. Other species of lumber warp so badly in drying that unless that tendency is largely overcome (as it was in our native sweetgum) the loss is just too great; or again some, though fortunately not many, species of wood produce a dust when worked which causes annoying irritation of the skin and mucous membranes of some people who work with it.

There undoubtedly are many valuable species of wood in the tropics. Brazil alone is said to have more than 3,000 species of timber, ranging from extremely light to extremely heavy. If a frequency curve were drawn showing the prevalence of species by property classes, the bulk of the species, no doubt, would fall somewhere near the middle between the two extremes.

In order to supply this country with badly needed hardwoods and to find a market for the many mature stands of timber in Latin-American countries, intensive studies should be made of the availability and characteristics of seemingly useful species in those countries. Investigations as to the density, structure, including straightness of grain and figure, chemical composition, shrinkage, strength, gluing, durability, workability, veneer cutting characteristics, and seasoning properties, should be made of species reasonably abundant and accessible. The job is too large for individual companies or private associations to carry on alone. It is true that some work already has been done by domestic and foreign organizations, but so far "they fall far short of solving the great and complex problem of properly utilizing the Latin-American hardwood forests," as Professor Record of Yale University so wisely put it a few years ago.*

This is a job of such magnitude and of such basic importance to the Nation that it should be undertaken by governmental institutions of this and foreign countries and the states thereof. The benefit will not be merely to the few who own or exploit the timber resources of Latin America, but to the consumers, the merchants, the manufacturers, the transportation companies, and to the laborers who do the work, both here and abroad.

Research in the utilization of foreign woods should have two basic

* Record, S. J. Factors in the Utilization of Latin-American Timbers. Jour. of Forestry 40(2) : 165-168. Feb. 1942.

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objectives, namely, (1) to determine their more important characteristics in a scientific manner so that definite data can be made available and comparisons can be made with better known native species, and (2) to overcome, if possible, objectionable features that certain species may have. The old trial-and-error method by means of which good uses were originally found for all species in civilized regions is too slow and expensive, and not sufficiently exact for modern needs. Science must supply the facts so that industry can apply them if we are quickly going to bridge the gap between urgent demand and supply.

Hand in hand with this essential technological research there should be an inventory of the untouched timber resources, and this involves exploration of the forest lands, identification of materials found there, and information about the availability of both new and known kinds of wood that show promise for veneer, cabinet work, and construction. A program like this should both stimulate and accompany the research that will eventually make the best of this new lumber available to northern industry. A large part of the more than two billion acres of forest land existing in Latin America alone is waiting today to be explored for usable timber.

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NOTICES AND REVIEWS OF RECENT BOOKS

Growers' Monograph On the "Orchid Cacti"

EPIPHYLLUM HANDBOOK. Scott E. Haselton. 222 pages, illustrated, indexed. Abbey Garden Press, Pasadena, Calif. 1946. $3.50.

My men folk fairly tore this book out of my hands. They have been raising hybrid epiphyllums on our enclosed porch in New Jersey for the last ten years—and they are a most beautiful and gratifying hobby — so when they saw Scott Haselton's handbook on these "orchid cacti" they were very excited - and not disappointed on any page. My husband says that all his plants have improved this past month since he put into practice some of the suggestions he found between its covers.

Scott Haselton, who is editor of *The Cactus and Succulent Journal,* in this book has presented a most thorough and meticulous study of the genus *Epiphyllum*, generously illustrated with numberless black and white photographs and drawings and with many color plates. It is fascinating. He covers the natural habitat, history, best practices for growing healthy plants, varieties, propagating, every phase and need of the many varieties and quotes innumerable growers. He also refers to every author on the subject, past and present. It seems to me the most complete monograph I have ever had the good fortune to meet, and it is very pleasant reading.

OLIVIA ERDMANN KUSER.

Know Your Trees

You will find this handbook with its 498 lucid illustrations an invaluable guide. To facilitate quick and accurate identification it not only illustrates the tree itself, but the leaves, fruits or berries, bark, transverse section of wood, and the locale in which each particular species may be found. An excellent text supplements the photographs.

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OF THE NORTHERN STATES AND CANADA
By Romeyn B. Hough

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In Canada

PLANTS OF THE NIAGARA PARKS SYSTEM OF ONTARIO. George H. Hamilton. 233 pages, illustrated, indexed. The Ryerson Press, Toronto. 1943. $4.

The resumption of automobile traveling since the end of the war has given a usefulness to this book which it could not have when it was first published, at the end of 1943.

With numerous illustrations, some colored, it describes briefly the common wild flowers to be found in the National Parks of southern Ontario.

Beauty in Switzerland

ALPINE FLOWERS. Carl Schroeter. 29 pages, illustrated. Oxford University Press, New York. 1945. $3.

Color printing such as is done only in Switzerland, where as many as 14 colors are used on a single plate, adorns this book, which contains 18 illustrations of the flowers to be found in Switzerland's lofty mountains. Some, such as *Clematis alpina, Lilium Martagon,* and *Arnica montana,* are familiar at least as to genus; others, such as *Soldanella alpina* and the tiny chocolate-scented orchid, *Nigritella nigra,* and the miniature *Rhododendron ferrugineum,* are strangers except to those who have climbed these mountains and had the delightful pleasure of finding these flowers for themselves.

A five-page text by Dr. Carl Schroeter and a description of each flower precede the color plates.

CAROL H. WOODWARD.

For Very Young People

HOW BIG IS BIG? Herman and Nina Schneider. 39 pages, illustrated. William R. Scott, Inc., New York. 1946. $1.50.

A picture book for very little folk, using vivid colors and large type to point out relationships in size between the things in nature, ranging from protozoa through trees and elephants to the stars.

PICTURED GEOGRAPHY SERIES. Marguerite Henry, illustrated in color and in black and white by Kurt Wiese. Albert Whitman & Co., Chicago, Ill. 1946. $.75 each.

Marguerite Henry has added eight new books to the series issued two years ago to carry children pleasantly to many distant lands. The newest books deal with Australia, the Bahamas, Bermuda, British Honduras, Dominican Republic, Hawaii, New Zealand, and the Virgin Islands.

New Editions and Reprints

PLANTS OF HAWAII NATIONAL PARK. Otto Degener. 314 pages, illustrated, indexed. Published by the author. New York Botanical Garden. 1945. $2.57.

Folklore and native customs are entertainingly combined with the descriptions and illustrations of plants in Hawaii National Park, where the traveler may see the majority of species he would find on a journey through the islands.

AN ILLUSTRATED MANUAL OF THE PACIFIC COAST TREES. Howard E. McMinn and Evelyn Maino. 351 pages, illustrated. University of California Press. Berkeley. 1946. $4.

Although described as a second edition, this well known volume is apparently no more than a reprinting by offset process, without change. The illustrations are profuse and clearly drawn, and, together with the leaf and habit keys, should permit ready identification by the amateur. Both cultivated and native species are included. An addendum by H. W. Sheppard provides a useful guide to horticul-

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tural suitability in various situations and for various purposes on the Pacific Coast.

JUNGLE IN THE CLOUDS. Victor W. Von Hagen. 263 pages, illustrated, indexed. Duell, Sloan & Pearce, New York. 1946. $3.50.

This is a welcome reprint of an exciting and intimate tale of a search for the quetzal bird in the towering mountain forests of Honduras.

New Data in Fibre Studies

CONTRIBUTION TO THE PHYSICS OF CELLULOSE FIBRES. P. H. Hermans. 221 pages, introduction. Elsevier Publishing Co., 1946. $4.

Even though this book supplies no final answers to many of the questions arising when cellulose fibres are examined, it is worthy of attention by everyone concerned with the physical structure of cellulose. In a highly theoretical manner it presents some commendable approaches to problems which demand extensive study in the future in order that a complete solution may be reached.

The book reports on a series of original physical measurements and makes theoretical deductions on various types of cellulose fibres. New data are presented for the determination of the density of cellulose in different media. The appendix explains the methods used in making the many intricate measurements given.

ALFRED J. STAMM, *Chief,*
Division of Derived Products,
U.S.D.A. Forest Laboratory,
Madison, Wisconsin.

Notes, News, and Comment

Conference. In place of the conference announced for Feb. 13, at which Dr. B. O. Dodge and Dr. Bassett Maguire were to be the speakers, the staff, augmented by a number of visitors, was addressed by Dr. F. R. Fosberg, who showed the kodachrome pictures he made while in Micronesia during the past year on a botanical survey for the U. S. Government.

Selected Film. "The Gift of Green," the New York Botanical Garden's sound and color film telling the story of photosynthesis, was chosen for the opening production at a six-weeks' conference on Films in Public Relations, taking place in Washington each Wednesday from Feb. 5 through March 12. During the discussion period, talks were given by David Flaherty, who directed the film; by Neil Kelly, Director of the Sugar Research Foundation, which made production of the film possible for the Botanical Garden, and by Dr. E. E. Naylor,

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who served as technical advisor and prepared most of the script for the film. The conference was sponsored by the American Public Relations Association, which selected "The Gift of Green" as an outstanding example of an educational film produced during 1946.

H. Hobart Porter. On Feb. 9 occurred the death of H. Hobart Porter, 81 years old, a member of the Board of Managers of the New York Botanical Garden since Jan. 12, 1925, and of the Corporation since 1926. He had been a member of the Garden's finance committee since 1929. A native of New York City and a graduate of Columbia University in 1886, Mr. Porter was a mining engineer by profession. As a consulting engineer, in 1914 he was offered the presidency of the American Water Works and Electric Company, to which he had offered a plan for reorganization. In little more than a score of years he directed the company from the red to an organization of many millions in assets. He was active in numerous engineering societies and was also a life trustee of Columbia University and for two years a member of the executive committee of the National Research Council.

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Taxonomic Index. The American Society of Plant Taxonomists started volume 10 of *The Taxonomic Index* with an 8-page printed periodical in paper covers. Heretofore, the Index has been mimeographed at the New York Botanical Garden. Dr. W. H. Camp is Editor; Mrs. Lazella Schwarten, Librarian at the Arnold Arboretum, and Dr. H. W. Rickett, the Garden's Bibliographer, Associate Editors. The Index consists of a general bibliographic digest of all current botanical literature either originating in the Western Hemisphere or pertinent to an understanding of its plants. It was established in 1938, and, except for the period of the war, Dr. Camp has been the editor since the beginning.

Marcia Garrick. Mrs. Walter L. Fleisher of New City, N. Y., who was known by her professional name of Marcia Garrick, died after a prolonged illness of pneumonia Feb. 15. A member of the Garden since 1942, she had taken an interested part in many of the institution's activities. At her home in New City, known as Saw Mill Farm, she raised herbs and wrote extensively on their culture and uses. Mrs. Fleisher was to have appeared on the New York Botanical Garden's radio program of March 5, speaking on "Starting a Garden of Herbs." Her place is being taken by Mrs. Oliver B. Capen of Bedford Village, N. Y., Chairman of the New York unit of the American Herb Society, an organization with which Marcia Garrick was also active.

Rydberg's Flora. The 969-page "Flora of the Prairies and Plains of Central North America" by Per Axel Rydberg, which has been out of print, is now available again. The price is $6. The book was first published by the Garden in 1932, shortly after Dr. Rydberg's death.

Radio. T. H. Everett was guest speaker on the Mary Margaret McBride program over WNBC January 10. He talked particularly about his recent trip to England and of the plants which have been exchanged, as a result, between the New York Botanical Garden and the Royal Botanic Gardens at Kew. The Garden was represented on the Modern Farmer program over WNBC the morning of Feb. 18 by Carol H. Woodward, who spoke on the Garden's publications.

BOOKS ON EXPLORATION

FOR those who like to read about exploration, a suggestive list of books is given below. Many of them are now out of print, but all may be seen and used in the New York Botanical Garden's library. The list does not pretend to be complete. On early exploration in North America alone, there are several sections of shelves packed with historic volumes. The selections have been made merely to whet the appetite and point the way toward hours of pleasant reading in significant volumes concerning chiefly exploration for plants.

EARLY COLLECTORS IN THE UNITED STATES

Earnest. E. ***John and William Bartram: Botanists and Explorers*** **1699-1777, 1739-1823.** Philadelphia, University of Pennsylvania Press, 1940. (Early American collectors who penetrated little known regions of North America).

Michaux, André. ***Journal,*** **1787-96.** With an introduction and notes by C. S. Sargent. Philadelphia, American Philosophical Society, 1889. (Collector sent by the French Government to North America).

Coues, Elliott. ***The History of the Lewis and Clarke Expedition.*** 4 vol. New York, Harper, 1893.

Rodgers, A. D. ***John Torrey; a Story of North American Botany.*** Princeton, N. J., Princeton University Press, 1942.

EXPLORERS IN LATIN AMERICA

Rickett, H. W. ***The Royal Botanical Expedition to New Spain,*** **1787-1820.** Waltham, Mass., Chronica Botanica, (publication date, April 1947). (Explorations of Sessé and Mociño in Mexico).

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Kaieteur Falls

ON THE PLATEAU above British Guiana's Kaieteur, one of the world's largest waterfalls, Dr. Bassett Maguire explored for the New York Botanical Garden before he undertook his Table Mountain Expedition in Surinam in 1944. In the Garden's Herbarium there are now approximately 2,500 specimens of plants which he collected during his 21 days there. The photograph on the cover was made as he approached the 822-foot waterfall from the Potaro river below. At the crest the waterfall is 400 feet wide.

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North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

APRIL EVENTS AT THE GARDEN

Members' Day

April 2 3:30 p.m. *Vacations Without Hayfever* — *Dr. R. P. Wodehouse*

Saturday Afternoon Programs

3 p.m. in the Lecture Hall

April 5 ***"The Farm Garden"*** **and** ***"Grow Your Own"***
Two vegetable gardening films from the U.S.D.A.

April 12 ***Planting About the House*** — *Ruth N. Wetzel*
April 19 ***Primroses You Can Easily Grow*** — *Aleita H. Scott*
April 26 ***Wild Flowers to Seek on Week-end Walks*** — *Walter H. Shannon*

Courses

April 14 ***Botany for Beginners*** — E. E. Naylor, Instructor
6 Mondays, 3-4 p.m. — $5

April 19 ***Field Botany*** — G. L. Wittrock, Instructor
15 Saturdays, 1:30-3 p.m. — $5 ($2.50 to teachers)

April 24 ***Indoor Gardening Practice***
8 Thursday, 6-7:45 p.m. — Edwin Beckett, Instructor
Open only to those who have successfully completed the winter term of lectures in *Cultivation of Greenhouse Plants*. Class completely booked.

Radio Programs

The programs scheduled to be given every other Wednesday over Station WNYC have been canceled because of the broadcasting of the proceedings of the United Nations by the City Station. Several of the same speakers will be heard over other stations in New York.

Forthcoming Events

Members' Day: May 7, "Adventures in a One-Man Greenhouse" by Victor Greiff. *Saturday programs*: May 3, Action Films of Garden Flowers by Allen K. White; May 10, Plants and their Wanderings by W. H. Camp. May 17, Wild Life in the Watchungs by Mildred J. Rulison. May 24, "Plants and the Life of Man" and "The Gift of Green" —the Botanical Garden's films. *Programs for Garden Clubs*: May 1, Tour to du Pont gardens in Wilmington. May 20, Garden Club Day at the New York Botanical Garden.

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One of many photographs by Mr. Beck in his current exhibit in the Museum Building.

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Plants As Treasure Houses Of Rare Chemicals

By George W. Pucher

IN addition to their esthetic appeal and food value, plants are the most amazing chemical factories in existence today. From them the biochemist has isolated hundreds of chemical compounds, many of which have been extensively publicized. Others of equal or of even greater biological importance are still in the category of the forgotten man. Future research undoubtedly will reveal practical methods for isolating and using these chemicals.

During the past twenty years the biochemical laboratory at the Connecticut Agricultural Experiment Station has investigated a large number of the chemical substances found in plants. Three of outstanding significance—asparagine, glutamine, and isocitric acid—will be described here.

These three chemicals occur in many plant tissues in amounts that vary from traces in some plants to quantities in other plants which make commercial production practical. These compounds are neither drugs, enzymes or vitamins, nor do they in themselves cure any disease, yet they already have made important contributions toward the promotion of human well-being.

Thus, ASPARAGINE, in spite of many attempts to find a more effective substitute, is still a preferred source of nitrogen for the growth of the tubercle bacillus. This organism is cultured in laboratories for the commercial production of tuberculin, which is used in hypodermic injections as a test for tuberculosis.

Traces of GLUTAMINE, a close relative of asparagine, are essential for the growth of certain haemolytic, or blood-destroying, streptococci. Use of this compound has simplified the laboratory culture of these pathogenic organisms and thus advanced medical knowledge of the origin and

Dr. Pucher is Research Associate in Biochemistry at the Connecticut Agricultural Experiment Station in New Haven.

treatment of diseases of which these organisms may be the causative agents.

Glutamine, obtainable from plants, also occurs in animals bodies, being an important constituent of the blood, liver, kidneys, and brains. It also undoubtedly plays essential roles in the transportation of nitrogen through the body and in the synthesis of certain nitrogenous products of metabolism—that continuous series of chemical changes in the body's cells, by which the energy is provided for vital processes and activities.

ISOCITRIC ACID, most recently encountered and by far the rarest of the substances mentioned, occupies a central position in the respiration cycle, which is one phase of the process of metabolism. That is, the respiration cycle is the chain of reactions by means of which both plant and animal cells utilize carbohydrates and release the energy necessary to maintain life and to function. Thus, in green plants it is part of the complicated sequence of reactions taking place during photosynthesis.* Isocitric acid, asparagine, and glutamine are all three intimately associated with the metabolism of the cell and as such have many unexplored functions.

The following résumé of these three compounds is given to illustrate both the family resemblances which have made recognition difficult and the rugged individualism which has made characterization possible.

ASPARAGINE

Asparagine, the structural formula for which substance is as follows:

$$HOOC \cdot CH(NH_2) \cdot CH_2 \cdot CONH_2$$

is an amino acid in which the hydroxyl of one of the groups has been substituted by ammonia. This type of compound is called an amide.[1]

Asparagine was recognized to be a constituent of asparagus stalks more than one hundred years ago, but this plant is not used today for the preparation of this compound. In 1848 Pirea (1)[2] extracted asparagine from seedlings, and the classical studies of Schulze (2) forty years later, then of Prianischnikov (3) in 1904, partially explained how the seeds of legumes were able to manufacture large amounts of this compound on germination in the dark. In this process, called etiolation, the large stores of seed protein are broken down into simpler constituents and a major part of the nitrogen from the protein is converted into ammonia, which in turn is resynthesized into asparagine. Thus, nitrogen, an essential component for subsequent growth of the plant, is conserved and stored in the form of a reactive compound, asparagine, which is easily moved to the growing points, where it is utilized for the building up of new protein as the plant develops.

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* See the Journal for August 1946, page 209, for an explanation of photosynthesis.

The capacity of different seeds to produce asparagine varies over a wide range, reaching its maximum in the seeds of the lupines. Thus *Lupinus albus* (4), grown in Europe, Africa and South America, and *L. angustifolius* (5), a plant of the Mediterranean region grown in Florida for its seed, are excellent sources for the preparation of asparagine. One hundred pounds of either species will yield from 10 to 16 pounds of pure asparagine on etiolation. To produce asparagine, the seeds are spread fairly thickly on wire mesh trays or baskets and placed in a dark chamber supplied with a continuous fine spray of water. Germination begins in 24 to 48 hours and, after from 12 to 20 days, the huge mass of colorless tissue is harvested, ground, and the tissue juices pressed out. The pale yellow solution is concentrated *in vacuo* until crystals begin to separate. After being cooled the asparagine is filtered off and purified by recrystallization from water. It is then ready to use in the preparation of many media on which bacteria and fungi are grown.

Asparagine is one of the simplest biological preparations since it has the property of crystallizing very easily from impure mixtures, in contrast to the other substances described below, which require the use of special reagents for their separation.

GLUTAMINE

The structural formula of the related compound, glutamine, given here:

$$HOOC \cdot CH(NH_2) \cdot CH_2 \cdot CH_2 \cdot CONH_2$$

differs from that of asparagine by only one—CH_2—group, which imparts to it chemical properties that make it a unique amide. For example, glutamine, in contrast to asparagine, is decomposed on boiling it with water, and thus presents problems that make its isolation difficult. In only one known case can this amide be obtained by direct concentration of a plant extract. It generally requires the use of several chemical reagents for the separation of a fraction that will yield a pure crystalline compound.

Glutamine was discovered by Schulze and Bosshard (6) in 1883 and evidence was advanced that it could replace asparagine in many plants. Schulze and other workers have attempted to classify plants according to their glutamine or asparagine content, but as yet there seems to be no clear line of demarcation. Furthermore, different species differ widely in their capacity to synthesize these two amides. Whereas the seeds of legumes may produce as much as 22 percent of their dry weight as

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[1] Asparagine can occur in two possible optical forms, or isomers, but only one of these is manufactured by the plant. This ability of plant tissues to synthesize only one of a pair of optical isomers cannot be duplicated in the laboratory, and this fact illustrates why plants are invaluable sources of biologically active compounds.

[2] Figures in parentheses refer to the bibliography at the end of the article.

asparagine, together with a little glutamine, the maximum amount of glutamine produced from squash or sunflower seedlings is not more than three to four percent of the weight of the dry seeds. Yet these seedlings are among the richest sources of this substance. The reasons for this are still unknown but may be related to differences in protein reserves and protein metabolism. In all cases so far examined, with perhaps the exception of the castor bean, sufficient quantities of both amides are produced so that separation for the preparation of glutamine is impractical.

On the other hand, beet roots have been found to be an excellent source for the preparation of glutamine (7). This root tissue contains only traces of asparagine and other compounds that interfere with the isolation of the desired amide. The amount of glutamine is dependent upon the variety of beet and upon the cultural conditions employed. The glutamine content of field-grown beets may be increased by the application of large amounts of ammonium sulfate a few days prior to harvesting.[3]

That beets are not unique in this respect is indicated by the fact that ordinary grass may, under certain unexplained circumstances, produce so much glutamine that it is deposited on the tips in white masses. This phenomenon was first observed by Greenhill and Chibnall (8) in England and also has been noted by Curtis (9) at this Station. On one occasion patches of the grass were found to have small white particles of glutamine as an encrustation on the tip of each blade. A sample contained 70 per cent glutamine by analysis while the grass leaves themselves contained four to five times as much glutamine as in the average beet root. Normally the glutamine content of grass is small and conditions have not yet been found by means of which the abnormal behavior can be artificially duplicated with certainty of success.

ISOCITRIC ACID

Isocitric acid, as its name implies, is isomeric with common citric acid:

$$HOOC \cdot \underset{\alpha}{CH(OH)} \cdot \underset{\beta}{CH(COOH)} \cdot CH_2 \cdot COOH.$$

Its structural formula shows it to be composed of the same elements in the same proportions, but they are differently arranged, therefore the properties of the compound are different.[4] Isocitric acid, in contrast

[3] This observation is of great biological significance, since it shows that the beet tissue contains or can easily manufacture a carbon chain precursor which will unite with ammonia to form glutamine.

[4] In isocitric acid, the hydroxyl (OH) group is on the alpha instead of the beta carbon as it is in citric acid. As a result, the molecule contains two asymetric carbon atoms and hence four different optically active forms of isocitric acid are possible. Only one of these exists in nature.

to citric acid, is very difficult to crystallize and is usually isolated in the form of derivatives which are readily converted back into isocitric acid.

The significance of isocitric acid as a biologically active component of animal tissues was not recognized until 1938, although it was synthesized in 1889 and was isolated from the juice of the blackberry by Nelson (10) in 1925. In 1942 Pucher and Vickery (11) proved that it was a major constituent of the leaves of *Bryophyllum calycinum*,[5] that amusing house plant known as "life-plant" or "floppers" because of its habit of developing plantlets with roots attached, around the margins of the leaves. They demonstrated its identity with crassulacean malic acid, a substance that has been a controversial issue among plant physiologists and botanists for more than 60 years.[6]

The solution depended upon the development of specific analytical methods by means of which it was possible to prove that all of the malic acid present in *Bryophyllum calycinum*, the species used by the older investigators, was the natural acid, and that this and other known acids accounted for only about 30 per cent of the total acids present in the tissues. The remaining 70 per cent must therefore consist of unknown acids. Study of the properties of this fraction led to the identification of isocitric acid as a major component.

Rereading the papers of Mayer, Aberson and Franzen in light of this discovery showed that all three undoubtedly had preparations of isocitric acid of varying degree of purity in hand, but failed to identify them correctly because the derivatives and salts which they prepared were indistinguishable from malic acid by the analytical methods then available.

The amount of isocitric acid in the leaves of *Bryophyllum calycinum* is phenomenal, amounting to as much as 14 percent of the dry solids, in contrast to the juice of the blackberry where it occurs to the extent of only about 1 percent. There is thus available, for the first time, a plant tissue from which it is possible to prepare isocitric acid in quantity, since the plant is easily propagated in the greenhouse and it grows luxuriantly in certain sections of the South. At present, the preparation of the pure acid is a difficult chemical procedure, the details of which are still in the

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[5] Also known as *B. pinnatum*.

[6] In 1875 Mayer (12) stated that the Crassulaceae contained an optically active acid which had the same analytical composition as malic acid but differed from it in physical properties. In 1898 Aberson (13) proved that crassulacean malic acid differed from the two known optically active forms of malic acid and concluded that the new acid was a third isomer. This exception to the rules of sterioisomerism, which state that compounds with one asymetric carbon atom such as malic acid, can have only two optically active forms, was possible in 1898 but is untenable in the light of our present knowledge. In 1922 Franzen and Ostertag (14) reinvestigated the acids of the Crassulaceae and concluded that there was no evidence to support the view that tissues of the family Crassulaceae contain a unique form of malic acid. This explanation was apparently such a relief to the stereo and other chemists that another twenty years elapsed before the correct answer to the problem was found.

experimental stages. However, there is every reason to believe that it can be simplified and that some day isocitric acid may be as common and as important a chemical as its well-known isomer, citric acid.†

The three compounds discussed above were prepared from three different plant sources—etiolated lupine seedling, beet root, and the leaves of *Bryophyllum calycinum*. The choice of source materials has been largely a matter of chance, and a comprehensive survey of plants in respect to their production of compounds of known biological value is urgently required. Such a survey requires infinite patience but the discovery of something new and useful is an inevitable result.

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† See the Journal for January 1946, page 15, for the preparation and uses of citric acid.

A Forest Lover in the Caribbee Islands

VI. *Saba to Montserrat*

By J. S. Beard

THE northernmost links in the volcanic chain of the Lesser Antilles are a series of relatively tiny islands distributed along a 70-mile arc. Their names are Montserrat, Redonda, Nevis, St. Christopher (St. Kitts), St. Eustatius (Statia) and Saba. The last two named are Dutch, the others British. Montserrat is neighbour to French Guadeloupe in the centre of the Antillean chain. North of Saba the volcanic arc ceases at the Anegada passage beyond which we come to the essentially continental structure of Puerto Rico and the Virgin Islands.

Looking north from Montserrat: Redonda in the middle distance, cloud-capped Nevis behind.

Redonda is just a high conical rock, too small to be inhabited. Its name is Spanish for "round" or "circular" as it is that shape in plan. Saba is next smallest, a single volcanic cone rising straight out of the sea to 3,000 feet elevation, with a large crater on the inside. It also is round in plan and there are no harbours. The island measures only 2½ miles in diameter. St. Eustatius (named Santa Anastasia by Columbus) and Nevis are also essentially single cones, beautifully symmetrical and with fairly well preserved craters, rising to 1,900 and 2,500 feet respectively. Upthrusting of the sea floor has exposed limited areas of lowlands around the bases of the cones, St. Eustatius thus measuring 2 miles by 5, and Nevis being an almost perfectly circular island 7 miles in diameter. Nevis contains 38 square miles and its name is derived from the shrine of Nuestra Señora de las Nieves (Our Lady of the Snows), *not* as is so often alleged because Columbus mistook its cloud cap for snow. He could not have been quite so simple! Actually this is not Columbus' name anyway: he called the island St. Martin.

Montserrat (after Our Lady of Monserrate, in Spain) is slightly smaller than Nevis, with 33 square miles, but is more mountainous, consisting in essentials of three volcanic massifs of different ages. The north of the island consists of an old volcanic remnant, Silver Hill, only 1,200 feet high. In the centre of the island rise the Centre Hills, moderately eroded and dissected; and in the south the Soufriere Hills, composed of one large

cone and several smaller ones, so recent that the structure of the principal crater is still very plainly visible. There are several fumaroles still active around the base of this mountain.

St. Christopher (colloquially St. Kitts) is the largest island in this group, with 67 square miles. There is a central mountain backbone formed by a chain of relatively young volcanic piles, skirted by a gently sloping apron, or glacis. At the north end of the island there is a well preserved crater, evidently in eruption not many centuries back. Part of the crater rim rises in a lofty exposed pyramid to 3,700 feet, highest elevation in this group of islands. This is aptly known as Misery Peak from the rigours of its wet, windswept climate. From the southeastern end of St. Kitts a long low promontory of barren hills reaches out towards Nevis, including in its folds a number of saline ponds where salt is collected.

These islands were discovered by Columbus in 1493, on his second voyage, but were never settled by the Spaniards. It was left to the English, more than a century later, to colonise them. In 1624 an English gentleman-adventurer, Sir Thomas Warner, planted a band of settlers upon St. Kitts and formed the second successful English colony in America, the Pilgrim Fathers having beaten him to it by three years. The French appeared too and for a long time the English owned the middle of St. Kitts and the French the two ends, a situation which led to constant strife. Eventually the English settlers represented to Queen Anne that this was a nuisance and at the next treaty the English were confirmed in possession of the whole island. Nevis also was settled by English; Montserrat by Irish. Dutch Saba today is peopled by the English-speaking descendants of buccaneers, who formed one of the scattered small white communities in the Caribbean, the population of the adjoining British islands being now predominantly negro.

The first settlers were white small-holders who grew indigo, tobacco and cotton. Later sugar was introduced with slaves to work it and the plantation era dawned. It still holds sway in St. Kitts where the sugar industry has been rationalised by construction of a circuminsular railway and a central factory. Sea island cotton is now the staple crop of Nevis and Montserrat.

Since the islands are all so small and have been so heavily settled for centuries, it would not be surprising to find that all the original forest had been completely destroyed. In point of fact, the forests have been cleared from all but the steepest and least cultivable parts of the central peaks, and even here a great deal of destruction has been done in the past. Nowadays, in all the British islands, legislation protects the forest on the central mountains in the interests of water conservation, so that the islands all present the appearance of broad, intensively cultivated aprons at the foot of steep forested slopes. Most of the forest seen in this way consists actually of low secondary bush which is growing back, but here and there

Most of the mountain slopes of Montserrat are covered by a low secondary bush, usually of tree ferns. The crowns of numerous tree ferns can be seen in this picture.

one can find examples of fine forest stands which survived through the interest of some former landowner. High up near the tops of the peaks the vegetation is still natural but is of a stunted nature because of elevation and exposure.

On Montserrat the writer knows of only one single patch of natural rain forest, and this is found on the South Soufriere Peak above O'Garra's estate. The dominant trees are the familiar *Dacryodes excelsa, Sloanea truncata* and *Richeria grandis.* It can be seen by a detour from the bridle path which passes the Galway Soufriere (a solfatara) just before crossing the col joining the South Soufriere Peak and Chance's Mountain. Elsewhere in Montserrat the mountain slopes are covered with a low secondary bush formed usually of groves of tree ferns (*Cyathea* and *Hemitelia*) with some pioneer trees.[1] Towards the top of Chance's Mountain around the extinct crater there is a survival of natural growth in the shape of palm brake, almost pure groves of the palm *Euterpe globosa.* This seems to be a reduced type of woodland formed on the more exposed parts of these mountains through the influence of the wind. One of the few trees found among the palms is *Hibiscus tulipiflorus,* a tree with yellow flowers which ranges from Montserrat to Martinique.

There is rather an interesting vegetation bordering the numerous

[1] These include *Sapium caribaeum, Tetrazygia discolor, Freziera undulata, Ochroma lagopus* and *Acnistus arborescens.*

SOUFRIERES or solfataras in this island. The sulphurous fumes emitted are deadly to most plants and any recrudescence of activity kills off vegetation which has encroached during a quiescent period. The soufrieres are associated with areas of dead trees and bare, exposed soil. Only certain resistant plants survive and one can observe clumps of two fleshy leaved little trees, *Clusia alba* and *Ternstroemia peduncularis,* with tussocks of the bromeliad *Pitcairnia angustifolia,* the sedge *Cyperus ligularis,* and the aroid *Philodendron giganteum.*

Some of the forest on Nevis is in quite good condition and one can find stands of rain forest containing the inevitable *Dacryodes excelsa* and *Sloanea truncata,* with *Beilschmiedea pendula* (a lauraceous tree with red bark), *Guatteria caribaca* and two trees of the Sapote family, *Poutcria multiflora* and *Micropholis chrysophylloides.* On the upper slopes this merges into a palm brake like that of Montserrat by way of a transitional belt where the sole conifer of the Lesser Antilles, *Podocarpus coriaccus,* is the dominant tree.[2] On this island there is also some xerophytic woodland on rocky hills near the sea. All of it is secondary growth, consisting of a low arid thicket with many thorny components.[3]

The forest area of St. Kitts is much the largest of any on these islands and thus contains better and more extensive stands. As our photograph shows it is possible to locate some very fine rain forest indeed. At its best the forest is tall and dense, with trees 100 and more feet high, crowded together with long cylindrical stems. Light is shut out so high above the ground that the interior of the forest is relatively empty. It is a great vault arching overhead, within which one finds relatively little growth. A few small trees on their way up to the canopy, many palms, some rare shrubs—these form something far removed indeed from the "impenetrable tropical jungle" of fable. Large-leaved epiphytes perch here and there in crotches or climb up the stems and an occasional large liane loops to the ground. The soil itself is covered with a close ferny mantle of *Selaginella flabellata* and *Dryopteris L'Herminieri* As always in the rain forest of the Caribbee islands *Dacryodes excelsa* is the dominant tree, forming 40 percent of the total tree crop. *Euterpe globosa* forms another 35 percent. The remainder is composed of much less common species.[4]

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[2] Among the many others seen there are *Drypetes pyriformis* and *Micropholis chrysophylloides.*

[3] Some of the more typical species include *Bursera simaruba, Tabebuia pallida, Croton, Capparis* and *Coccoloba* species, *Guettarda scabra, Pithecellobium unguiscati* and *Fagara* species.

[4] Three species of *Sloanea* are present—*S. berteriana, S. dentata* and *S. massoni,* There are a number of members of the Laurel family (Lauraceae)—*Aniba bracteata, Beilschmiedea pendula* and some species of *Ocotea,* difficult to identify. *Simaruba amara* is frequent, *Ormosia monosperma, Guatteria caribaca* and *Meliosma herbertii* are large dominant trees often seen. Smaller trees of the lower layers include *Hirtella triandra,* with pretty white flowers and blue fruit, *Marila racemosa,* and *Faramea occidentalis,* the latter showy when in flower with its white blossoms.

On the upper slopes of the mountains in these islands a palm brake is found, of which this thick grove of Euterpe globosa on Montserrat is a part.

There is some really fine forest on St. Kitts. A buttressed Sloanea is seen centre, bel some Dacryodes, and several Euterpe palms.

Unfortunately, the finest stands of forest are restricted in area, the two best examples lying on Wingfield and Mansion estates, on opposite sides of the mountain backbone just south of the old trail across the island by way of Phillips' Level. The remaining high forest consists mostly of a ruinate growth badly damaged by the intermittent hurricanes. Floristic composition is much the same, but the structure of the forest is sadly impoverished. Large trees are scattered and show signs of breakage at some time, usually forking quite low down into two or three stems. The spaces in between are filled quite variably with groves of palms or thickets of adventitious tree species.

On the higher mountain slopes the rain forest merges into a palm brake as described for Montserrat and this in turn at the summits becomes an elfin or mossy woodland, a low gnarled growth usually about 12 feet high, loaded with moss and epiphytes, matted with lianes. The flora is characteristic and it differs from that of the rain forest below, featuring *Charianthus coccineus* (a melastome with showy red flowers), *Didymopanax attenuatum* (with pale-coloured, palmate leaves), *Hedyosmum arborescens* (with fleshy, aromatic leaves and aerial roots). Other prominent plants are *Frezicra undulata, Podocarpus coriaceus* and *Weinmannia pinnata.*

The great pyramid of Misery Peak, rising 600 feet clear of its surroundings, is covered with a low, recumbent vegetation which may be compared in a certain sense to the Andine PÁRAMO. The plants consist in the main of species from the elfin woodland, now reduced to small knee-high shrubs. With them associate various herbaceous plants,[5] notably bromeliads, aroids and ferns, a few ground orchids and other flowers, and some sedges and grasses.

Two Awards for Plant Explorer's Jungle Camp

TO emphasize the importance of plant exploration, the New York Botanical Garden presented a plant explorer's jungle camp at the International Flower Show March 17—22 at Grand Central Palace. The exhibit won a gold medal from the Flower Show Committee and the tricolor citation of the Garden Club of New Jersey, the second award being comparable to the bronze medal formerly offered in days when metal was not scarce.

[5] Among the species represented are *Pitcairnia angustifolia, P. spicata, Lycopodium tortum, Struthiopteris striata, Dryopteris limbata, Epidendrum mutelianum, Lobelia cirsiifolia, Isachne angustifolia, and I. rigidifolia,* also a species of *Anthurium* and of *Dicranopteris* or *Gleichenia.*

The scene, which included a shelter equipped with hammock, mosquit netting, plant presses, fuel cans, lantern, machetes, an axe, and other objec in daily use by a plant explorer, simulated a jungle, essentially tropica American. A large ceriman, or Mexican breadfruit (*Monstera deliciosa* clambered to the top of an old tree trunk at the rear. Affixed to th crevices and crotches of the tree were epiphytic orchids, ferns, bromeliad and other plants, while a common South American creeper, *Solanum ja minoides,* draped itself over a branch. The same creeper appeared o the jungle floor with *Fittonia Verschaffeltii* var. *argyroneura,* anothe common plant of the tropical American jungle, and with arrowroo (*Maranta arundinacea*), common throughout the tropics but native to th Americas. With them one of the few Asiatic plants used in the exhib helped to cover the ground—*Piper Betle,* with dark green heart-shape leaves.

Aroids were prominent in the scene, one of the most noteworthy spec mens, because of its spadices that were laden with red fruits, being a plar of *Anthurium hacumense,* which the Garden obtained from Panama mor than forty years ago. Somewhat resembling it was a specimen of *Philo dendron Wendlandii* from Central America, with white buds like tightl rolled calla-lilies displayed in the center.

The largest *Philodendron* was *P. verrucosum,* which has been growin for many years on an enormous stump in the Palm House in the Garden' conservatory. The heart shaped leaves of this species are marked wit reddish tones beneath and are roughly hairy. Near it stood a slende cut-leaved species, *P. Selloum,* with prominent leaf-scars on the trunk an with prop roots descending from the stem.

Arousing the greatest interest, because it was mentioned in the Herald Tribune on the opening day of the show, was the breadfruit tree (*Arto carpus communis*) at the rear corner of the shelter. A number of palm completed the background, with numerous smaller plants in the foregroun Among them were two specimens of *Begonia foliosa,* discovered abou 1800 by Alexander von Humboldt, a plant of an Asiatic *Cypripedium* and another orchid, *Schomburgkia undulata,* from Colombia.

Six glassed-in cases at the side of the exhibit, not visible from the jung scene itself, held nine significant plants which have been brought int horticulture or other use as a result of plant exploration. One of thes was an unnamed aroid, discovered by Dr. Bassett Maguire on Tabl Mountain in Surinam in 1944, which offers promise as a house plan Another was a young plant of *Cinchona succirubra,* one of the sources o quinine. Others were *Dracaena Goldieana,* handsomest of all dracaena sent to the Royal Botanic Garden at Edinburgh in 1867 by a missionar Rev. Hugh Goldie, from west tropical Africa; *Cyclamen persicum,* a tir plant from the Mediterranean region, source of our showy florist

Jungle scene and part of the plant explorer's camp which won two awards for the New York Botanical Garden at the International Flower Show in New York in March.

cyclamens of the present day; *Tradescantia Warszewicziana,* named for a Polish botanist—an excellent but little known house plant; *Stachys saxicola,* discovered in the 19th century by the French botanist Cosson while exploring in the mountains of Morocco; an attractive dwarf palm, a *Chamaedorea,* brought to the Garden in recent years by Thomas MacDougall from Mexico; *Anthurium Scherzerianum,* named for its discoverer in Central America, a small-flowered species with exceedingly shiny red spathe; and *Begonia foliosa.*

Printed information about the New York Botanical Garden was distributed throughout the week by a crew of volunteers under the direction of Mrs. John G. Winchester. Questions about the plants and about methods of exploration were answered by members of the staff, one of whom was always in attendance.

The award from the Garden Club of New Jersey was designated: "Tri-color citation of the Garden Club of New Jersey for an educational exhibit showing the important relationship between botany and horticulture through its emphasis on plant exploration, as presented in a tropical jungle scene."

The Interlaken Seedless Grape

By A. B. Stout

THE January number of *Farm Research* published by the New York State Agricultural Experiment Station at Geneva and the Cornell University Agricultural Experiment Station at Ithaca has the first description and illustration of the new ***Interlaken Seedless*** grape.[1] The illustration of a cluster of fruit is from a photograph taken at Geneva. The description is as follows:

A NEW yellow-fruited, very early, seedless grape was named Interlaken Seedless. This variety is a seedling of Ontario crossed with Thompson Seedless, the small-berried greenish seedless grape which is so widely grown in California. Tho the latter, also known as Sultanina, is primarily a raisin grape, it is also used for table purposes and is often seen in eastern markets during August and September.

Interlaken Seedless bears clusters of medium size which are well filled and often shouldered. The berries are slightly larger than those of Delaware. They ripen very early, about September 1 at Geneva, or a full month before Concord. Tho greenish yellow when the fruit first becomes edible, it later ripens to a rich golden yellow color. From a practical standpoint the berries are essentially seedless.

The fruit of this variety has a high sugar content and the flesh is meaty like that of Thompson Seedless rather than of the slipskin type. The flavor is a delicious blend of that of Ontario with that of Thompson Seedless. The fruit, like that of Schuyler and Steuben, will keep in cold storage much longer than that of most eastern varieties and has been held in good condition until late December. The vines are vigorous and of moderate productivity. In hardiness the variety compares favorably with Seneca, Golden Muscat, Schuyler, Delaware, and Dutchess. Temperatures of—20° F may be expected to injure the wood of Interlaken Seedless.

Interlaken Seedless was developed in collaboration with Dr. A. B. Stout of the New York Botanical Garden, who has been working on the problem of developing hardy seedless grapes at Geneva for more than 25 years.

Reports [2, 3, 4, 5] of this research on seedless grapes have been made to readers of the Journal of The New York Botanical Garden and several reports and bulletins have been printed elsewhere.

In this research a total of 309 individual seedlings have been obtained which bear seedless or near seedless fruits. All of these have been obtained in first or later generation progenies of hybrids between hardy, seeded, bunch grapes and the two vinifera seedless known as Thompson Seedless

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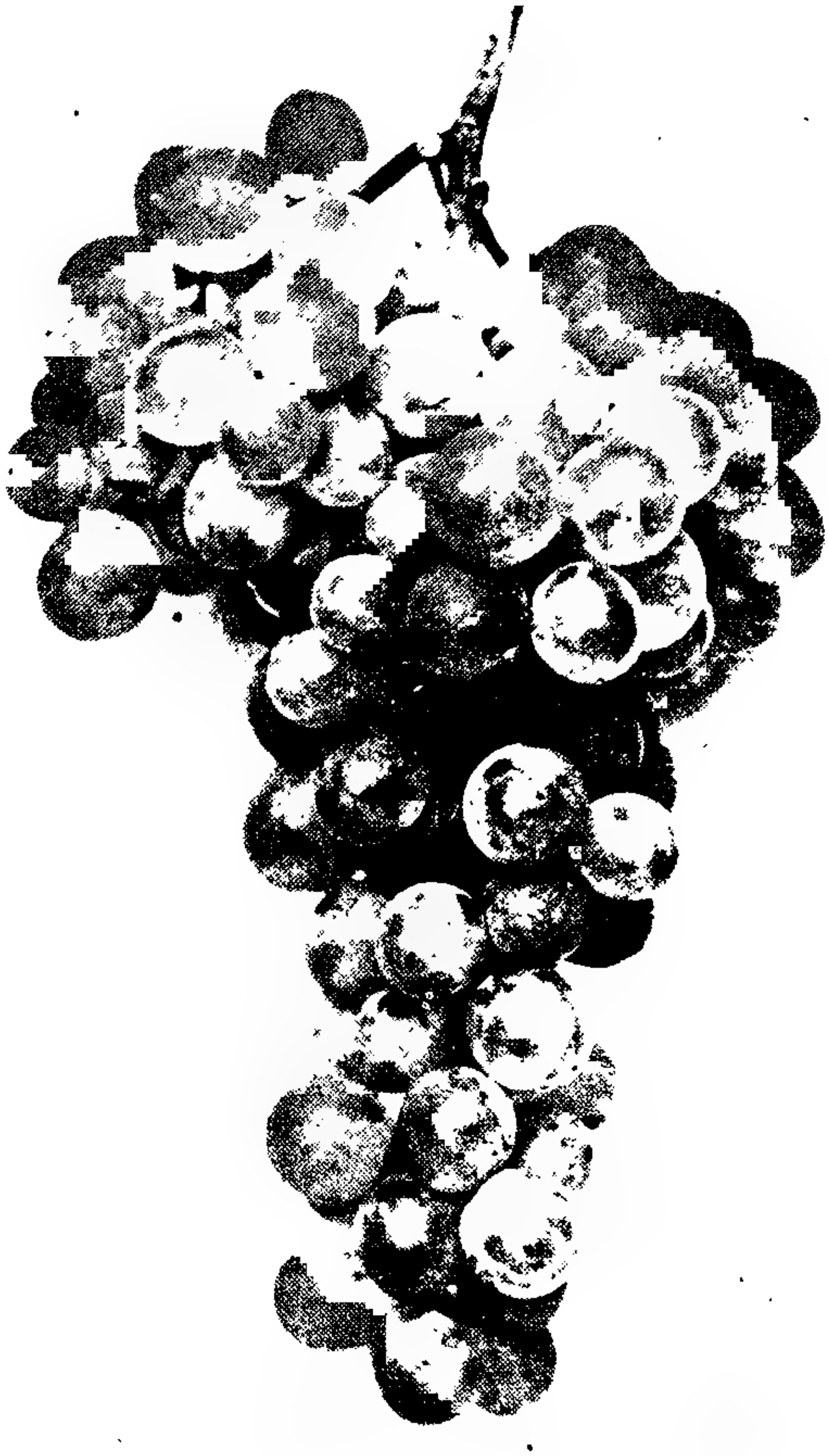
[1] Three New Grapes that Show Promise. George D. Oberle. Farm Research 8: 9. 1947.

[2] Studies of grapes in co-operation with the State Agr. Exp. Sta. at Geneva. A. B. Stout. Jour. N. Y. Bot. Garden 22: 148-156. 1921.

[3] A new seedless grape. A. B. Stout. Jour. N. Y. Bot. Garden 28: 20-23. 1927.

[4] Some chronicles of grape history. I. A. B. Stout. Jour. N. Y. Bot. Garden 39: 254-263. 1938.

[5] Some chronicles of grape history. II. A. B. Stout. Jour. N. Y. Bot. Garden 39: 274-281. 1938.



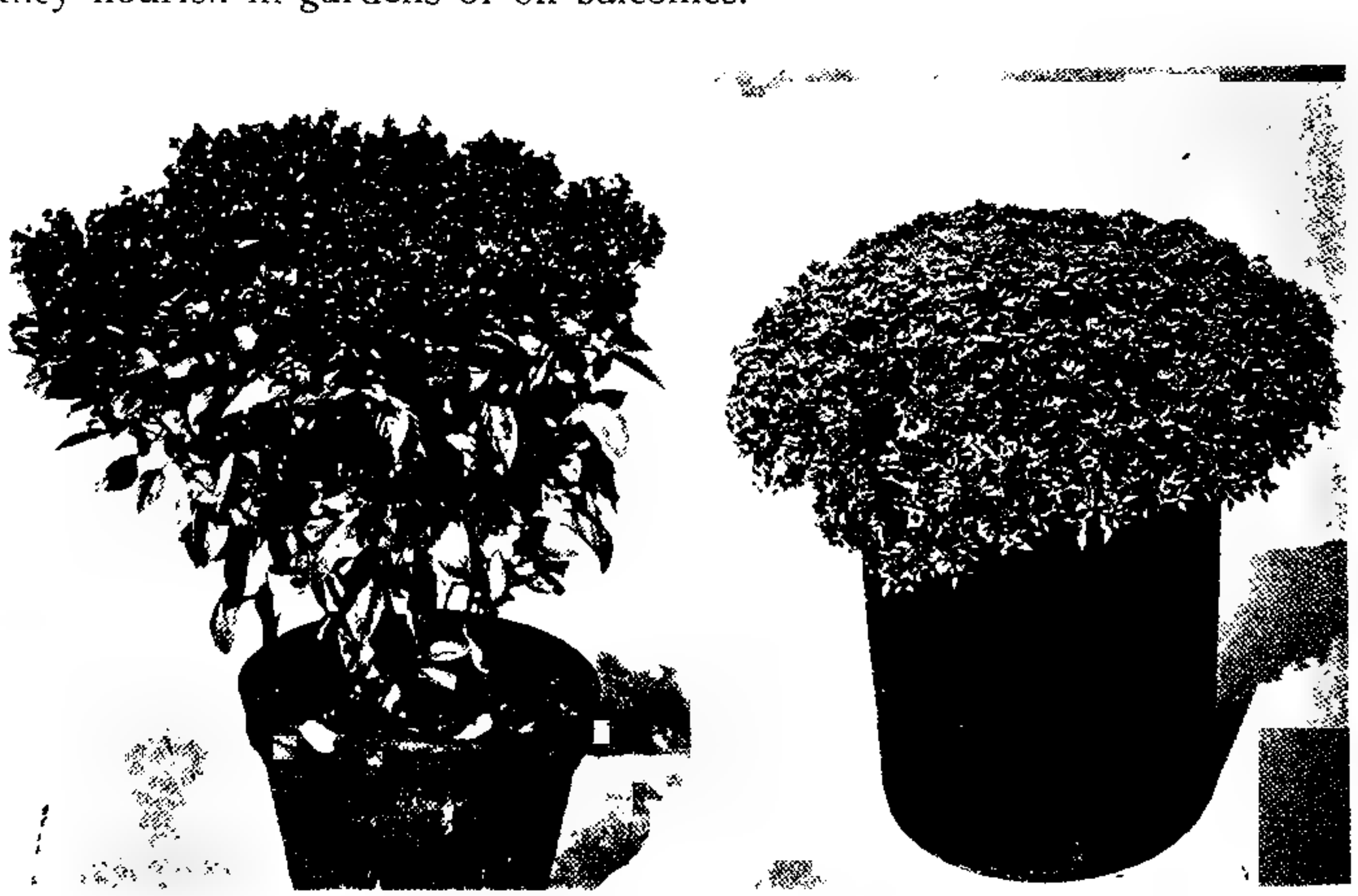
Interlaken Seedless, an early yellow seedless grape developed at the New York State Agricultural Experiment Station. It appears to be the most promising seedless grape produced to date for eastern grape-growing areas.

and Black Monukka. At least 50 of these which have fruit of high quality have been propagated for trial culture at Geneva and several that are most hardy have been tested elsewhere in vineyard culture. Of these the ***Interlaken Seedless*** will now be available in limited numbers, according to the amount of nursery stock, from the New York Fruit Testing Association at Geneva.

The Legend of the Basil

By Bessie R. Buxton
Peabody, Mass.

HOMESICKNESS manifests itself in many ways and one of the most familiar ones is growing the well-loved flowers of the Homeland. This is especially true of natives of the Mediterranean countries where flowers and fruits are so plentiful. The Greek people do this, perhaps more than any other, and one sees large and handsome specimens of orange, lemon and fig in the windows of the Greek shops. In summer, they flourish in gardens or on balconies.



TWO KINDS OF BASIL GROWN BY THE GREEKS IN MASSACHUSETTS

The purple-leaved form is shown at the left, the common species, Ocimum Basilicum, at the right. O. minimum, with smaller foliage, also is cultivated.

One plant will almost surely be found in Greek gardens and shops, the basil or BASILICO, as they call it—*Ocimum Basilicum.* This is a sacred herb to the Greeks, and every Greek child knows the legend.

Queen Helena, the mother of the Emperor Constantine, in her search for the true cross, was directed in a dream, to search where fragrance filled the air. Searching the hills, she suddenly stepped on a mass of basilico, and its fragrance revealed to her the Holy Cross, — buried beneath it.

Devout Greeks start the basilico seed in the house in February. Later it is transplanted into boxes or tubs and set in the garden, where it grows into a beautifully rounded specimen of tender green about two feet high. The white flowers are tiny.

Three varieties are grown, the common species, with ovate leaves one to two inches long; *O. minimum,* with very fine, delicate foliage, and a purple-leaved form of *O. Basilicum.* The slightest brush against the foliage of the plant sends a wave of spicy perfume through the air.

Italians and other races use the basil in cooking, but to the Greeks this is sacrilege. They grow it only for its religious significance.

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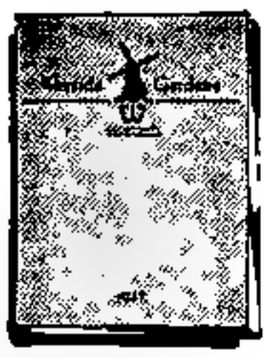

Wayside Gardens

51 Mentor Ave. Mentor, Ohio

Notes, News, and Comment

Flower Show Visitor. Lord Aberconway, President of the Royal Horticultural Society in England for the past 16 years, was a luncheon guest at the New York Botanical Garden Sunday, March 16. After a tour of the Garden he visited the International Flower Show which was then in process of preparation, returning several times during the week after it was completed. Having come to New York as representative of the Royal Horticultural Society at the Flower Show, Lord Aberconway was guest of honor at the annual luncheon of the Conservation Committee of the Garden Club of America March 19 at the Waldorf-Astoria. Dr. Fred J. Seaver was the Garden's representative at the luncheon. Lord Aberconway's gardens at Bodnant, Tal-y-Cafn, North Wales, are a famous show place.

Art Exhibit. Approximately 500 attended the opening of the Winslow Homer exhibit staged for the benefit of the New York Botanical Garden Feb. 18, and during the month that the pictures were on view at the Wildenstein galleries, there were more than 6,000 visitors. The exhibit was open to the public on weekdays from Feb. 19 through March 22.

Medal. T. H. Everett has been awarded the Thomas Roland medal for skill in horticulture by the Trustees of the Massachusetts Horticultural Society.

Superintendent. Ronald Townsend, former student gardener and a graduate of the Botanical Garden's Science Course for Professional Gardeners in 1939, became Superintendent of the Huntington Botanical Garden, San Marino, Calif., Feb. 10.

Show Windows. During part of the month the Winslow Homer exhibit was at Wildenstein Galleries, the Bonwit-Teller department store devoted four windows to the New York Botanical Garden. There were panels showing scenes in the conservatories, and a figure of a boy picking apples represented one of the Homer paintings in the exhibit. One window at Lord & Taylor's contained a reproduction of one of Homer's paintings.

Du Pont Garden Tour. On May 1 the New York Botanical Garden is sponsoring a tour of the gardens of Henry F. and Pierre du Pont at Wilmington, Del. Members of the Federated Garden Clubs of New York, New Jersey, and Connecticut are being invited. Mrs. Henry F. Fenimore Cooper is making the arrangements

Garden Club Day. The second annual Garden Club Day at the New York Botanical Garden is being sponsored this year by the Advisory Council and will take place May 20. At 11:30 a.m. there will be an hour's demonstration of the usefulness of the Botanical Garden under the title: "The Amateur Asks . . . The Experts Answer." This will be in the form of a symposium with T. H. Everett as moderator. Those who attend are expected to bring their own lunches; coffee will be served. At 1:30 there will be guided tours of special features of the Garden, such as the conservatories, library, spring flowers, rock garden, and trees and shrubs. Mrs. Robert H. Fife is chairman of arrangements, with Mrs. Guthrie Shaw and Mrs. Junius Richards serving as co-chairmen.

Guests. Judges of the Court of Appeals of the State of New York were guests

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at the New York Botanical Garden Sunday, Jan. 26. Dr. William J. Robbins gave them a brief address in the Members' Room.

Radio. The following staff members spoke on various radio programs in connection with the International Flower Show at Grand Central Palace, where the New York Botanical Garden exhibited a Plant Explorer's Jungle Camp.

Elizabeth Hall, on "This is New York" over WCBS March 14 at 9 a.m.
Dr. W. H. Camp on Bessie Beatty's program over WOR March 14 at 10:15 a.m.
Mrs. J. W. Beals, Jr., on Lillian Okun's program over WMCA March 15 at 1 p.m.
Dr. Bassett Maguire and G. L. Wittrock on Nancy Craig's program over WJZ March 17 at 12:30.
Dr. E. E. Naylor on the "Modern Farmer" hour over WNBC March 18 at 6:45 a.m.
T. H. Everett and E. J. Alexander on Margaret Arlen's program over WCBS March 18 at 8:45 a.m.

Staff Conference. The regular monthly conference of the scientific staff was held on March 13. Dr. B. O. Dodge discussed "Heterocaryosis in *Neurospora tetrasperma* and in *N. sitophila* and *N. crassa*." Dr. Bassett Maguire spoke on "The Boundary Limits for the Intermountain Flora."

Lectures. Rutherford Platt, a member of the Corporation of the New York Botanical Garden and author of "This Green World," lectured for the Pennsylvania Horticultural Society, Feb. 18. On Jan. 21 Dr. William J. Robbins spoke before the same group on "Plants and their Significance in the Life of Man."

Mrs. Annette Hervey spoke as the representative of Dr. Robbins at the annual luncheon of the Riverhead Garden Club Jan. 13. Her subject was "The Work of the New York Botanical Garden."

T. H. Everett lectured on "Needed—Craftsmen in the Garden" to the Horticultural Club of Boston, Feb. 11; on "Rock Gardens" to the Larchmont Garden Club, March 3; on "Rebuilding Our Gardens" to the Rockville Center Garden Club; and on "Spring Work in the Garden" to the garden section of the Bronxville Women's Club, the last three being Affiliates of the Botanical Garden.

Dr. William J. Robbins spoke on "Plant Research as Related to Medicine" at a meeting of the Bedford Garden Club Feb. 5.

Dr. H. N. Moldenke lectured Feb. 17 on "Marvels in Adaptation Among our Local Plants" to the Garden Club of Mt. Vernon, an Affiliate of the Garden, and on "Plants of the Bible" Feb. 18 to the Greenwich Garden Club; March 19 to the Newark Garden Club, and March 21 to the Harrison Garden Club.

Instructor. Edwin Beckett, Superintendent of Middletown Farm, Red Bank, N. J., will replace Joseph W. Tansey as instructor for the spring term in the Two-Year Course in Practical Gardening, *Indoor Gardening Practice,* commencing April 24. Mr. Tansey has been teaching the winter term on *Cultivation of Greenhouse Plants.*

Visitors. Dr. Michael Evenari came to the Garden Jan. 23 and stayed two weeks obtaining information toward establishment of a botanical garden at the Hebrew University, Jerusalem. Dr. Evenari is a plant physiologist, making an extensive tour of the United States.

Dr. C. G. G. J. van Steenis, Senior Botanist of the Department of Economic Affairs, Buitenzorg, Java, spent a week at the Garden in January, while on his way to Holland, accompanied by Mrs. van Steenis. He brought with him paintings for color plates for a proposed new

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flora of the Malaysian Archipelago, *Flora Malesiana.*

Dr. Ernst Gäumann, mycologist at Zurich University, and author of a book on comparative morphology of the fungi, visited the Garden Feb. 19.

Dr. M. G. Mes, Professor of Botany at Pretoria, South Africa, was a recent Garden visitor. A former student of Dr. George S. Avery, Jr., she has come to this country again to meet American plant physiologists.

Dr. Robert A. Vines of the University of Texas brought to the Garden in February a portfolio of illustrations he has made for a projected Flora of Texas and adjoining states along the Gulf.

Other recent visitors have been C. G. Church, Brown University; Kenneth S. Baker, University of California; K. Loftus Hills of Australia, now spending a year in Washington, D. C.; Ernst J. Schreiner, U. S. Forest Service; George H. Shull, Princeton University; Henry K. Svenson and G. H. H. Tate, American Museum of Natural History; John Ehrlich, University of Idaho; and Lord Aberconway, President of the Royal Horticultural Society of England.

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Groups. Among the classes which have recently visited the conservatories are 80 students from Chatham High School, Chatham, N. J.; 17 students from Hunter College; 20 from the Franklin School of Professional Arts, to do painting; and the Purchase Girl Scouts.

Museum Exhibits. Several cases of black and white photographs, mostly of orchids, spring flowering plants and winter scenes, made by Donald Beck of the Bronx, an amateur photographer, are on exhibit on the main floor of the Museum Building. Approximately all of the photographs were made on the grounds and in the conservatories of the New York Botanical Garden.

Two dozen black and white photographs, chiefly of spring flowers, by Samuel H. Gottscho were recently exhibited in the Museum Building.

For three weeks, enlarged kodachromes of familiar spring plants and of autumn scenes by Rutherford Platt were on display.

Models by Paul Marchand, showing some of our common mushrooms, among them a few deadly poisonous ones, are on display just off the rotunda. These are shown in a natural setting and are under illumination. More models will be added within a few weeks.

Addisonia. Because of the inadequacy of funds emanating from the Addison Brown bequest by which *Addisonia* was established in 1916, coupled with the high cost of color-plate engraving at present, this periodical of the Garden will be published henceforth at irregular intervals. For many years (until 1932—volume 17) it came out four time a year. In 1933 it was decided to issue two numbers annually, and in 1939, with volume 21, it was made an annual publication. Since 1937 it had been given free to members of the Garden. The first economy in the publication of *Addisonia* was effected in 1920, at the beginning of volume 5, when the number of plates in each part was reduced from ten to eight. Today, rather than have the periodical become a liability, the Garden will now issue a number only when sufficient money has accrued to make publication possible. The price will remain the same—$2.50 a copy or $10 a volume of four numbers, each containing eight colored illustrations of plants with popular and technical descriptions.

NOTICES AND REVIEWS OF RECENT BOOKS

Liverwort Genus Treated In a Scholarly Monograph

THE GENUS BAZZANIA IN CENTRAL AND SOUTH AMERICA. Margaret Fulford XVI + 176 pages, illustrated, indexed Chronica Botanica Co., Waltham, Mass. G. E. Stechert & Co., New York, 1946. $5.

Till crack of doom the liverworts to most biologists -and to many botanists – will mean *Marchantia*, even though the leafy forms are often more common, and in many ways much more representative. One of the most conspicuous, widespread, and, thanks to Dr. Fulford, best known genera of the leafy liverworts is *Bazzania*.

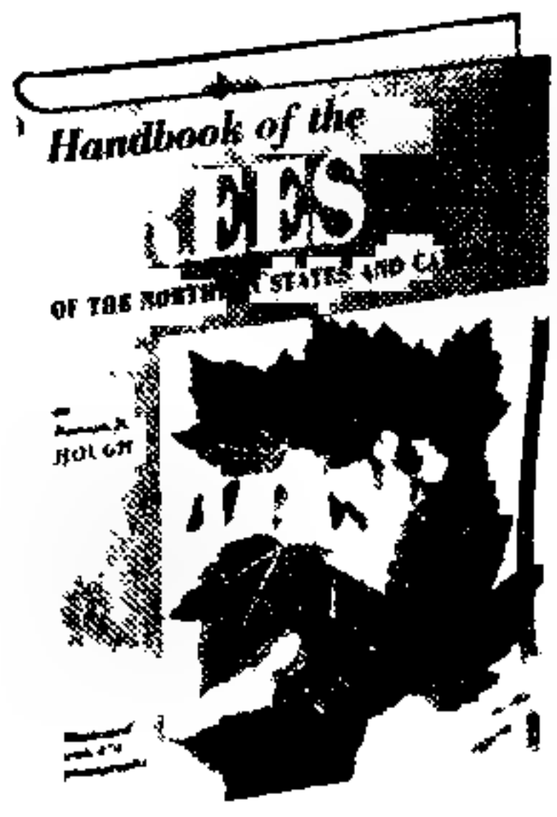
In a previous publication the author considered the 6 species of this genus found in the United States and Canada. The present volume deals with the 46 species authoritatively known from Central and South America. These treatises therefore give an accurate portrayal of the genus as it occurs in these two large areas. Much of the work has been done at the New York Botanical Garden.

The 46 species of Central and South America are grouped into two subgenera: Bidentatae, including 7 species, and Tridentatae, with 39, the representatives of each being true to these characterizations Each species is then described at length; the habitat is given, followed by a discussion, in which distinguishing features are considered, as well as varieties and forms, when present. Distribution and references for every species are listed. There are 17 new combinations.

The 59 figures, some of which consist of as many as 20 separate drawings, show habit sketches, leaf characters, lobings, cellular interrelationships in the leaves and bracts, and other minutiae.

Know Your Trees

You will find this handbook with its 498 lucid illustrations an invaluable guide. To facilitate quick and accurate identification it not only illustrates the tree itself, but the leaves, fruits or berries, bark, transverse section of wood, and the locale in which each particular species may be found. An excellent text supplements the photographs.



MACMILLAN

$5.50

Handbook of the

TREES

OF THE NORTHERN STATES AND CANADA

By Romeyn B. Hough

At your bookstore

To specialists Professor Fulford's earnest and scholarly treatise will be invaluable. To knights of the test tube or the microtome, as well as to general and field botanists, a perusal of this book should offer a rewarding glimpse of one of our common and attractive even if less showy genera of plants.

The volume is appropriately inscribed to Alexander W. Evans.

EDWIN B MATZKE,
Columbia University.

More than a Text For Health Officers

WATER BACTERIOLOGY. S. C. Prescott, C. E. A. Winslow, and M. H. McCrady. Sixth edition, 293 pages, appendix, bibliography, index. John Wiley & Sons Inc., New York, 1946. $4.50.

The sixth edition, the first in 15 years, is more than a new edition of an old book; it is, rather, a new book written on the framework of the old. Mr. McCrady, who has been closely identified with the development of the field, is a new co-author and is principally responsible for the revision.

The book is more than a text; it is a series of monographs covering various phases of the subject. Historical developments are discussed as a background for current practice. The literature has been thoroughly analyzed, frequently aided by the use of tabular material. Conclusions have been drawn which will meet general agreement from workers in this field. The bibliography of 52 pages is an indication of the thoroughness of the work.

This unique book belongs on the must list for health officers, sanitary engineers, bacteriologists, and those engaged in teaching public health. Used in conjunction with Standard Methods it will be of constant assistance to those interested in the role of bacteriology in sanitary problems dealing with water.

The arrangement of chapters is logical and the sub-headings are listed in orderly fashion. The index is adequate for locating information rapidly.

The authors are to be congratulated on a noteworthy accomplishment.

RALPH S. MUCKENFUSS, M.D.,
Director, Bureau of Laboratories.
LEON BUCHBINDER, PH.D.,
Head, Division of Sanitary Bacteriology.
City of New York.

Landscaping Effectively With a Minimum Of Effort

GARDENING WITH SHRUBS AND SMALL FLOWERING TREES. Mary Deputy Lamson. 281 pages, illustrated, indexed. M. Barrows & Co., New York, 1946. $2.75.

Although much that Mrs. Lamson has to say at first seems very elementary, for the new and unwary gardener such instruction is helpful; and as the book continues it becomes increasingly valuable to the experienced gardener. With its carefully thought out charts and charming photographs, it deserves a place on garden workroom shelves for ready reference—particularly if one belongs to the class of the over-extended. When my own too enthusiastic hands are swamped with more than they con possibly cope with, it has now and then occurred to me that just such comparatively effortless yet satisfying gardens as Mrs. Lamson recommends would be bliss indeed!

The chapter entitled "How to Learn from Arboretum, Park or Botanical Garden" points out the value of such places for first-hand study before planning or revamping one's garden. They are assets at our command, yet too often overlooked.

KATHERINE G. FENIMORE COOPER.

Guide for Embellishment Of Home Grounds

THE ENCYCLOPEDIA OF TREES, SHRUBS, VINES AND LAWNS. Albert E. Wilkinson. 483 pages, illustrated, glossary. The New Home Library, Philadelphia, Pa., 1946. $1.

This reference work on trees, shrubs, vines and lawns for the amateur gardener is divided into two parts. The first is an encyclopedia of the popular varieties used as decorative material in the embellishment of home grounds and buildings. Listings are made also of some of the lesser known species, and both native and exotic materials adaptable to varying climatic conditions are included.

Part two is taken up with information pertaining to the general care of plant material, the landscaping of grounds, making and caring for lawns, soils, fertilizers, insect pests and diseases of plants and their control, and much other useful information of interest to the gardener.

The book has many illustrations, drawn by Tabea Hoffmann.

EDWIN BECKETT.

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Membership in
THE NEW YORK BOTANICAL GARDEN
and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
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Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*_____.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

JOURNAL

OF

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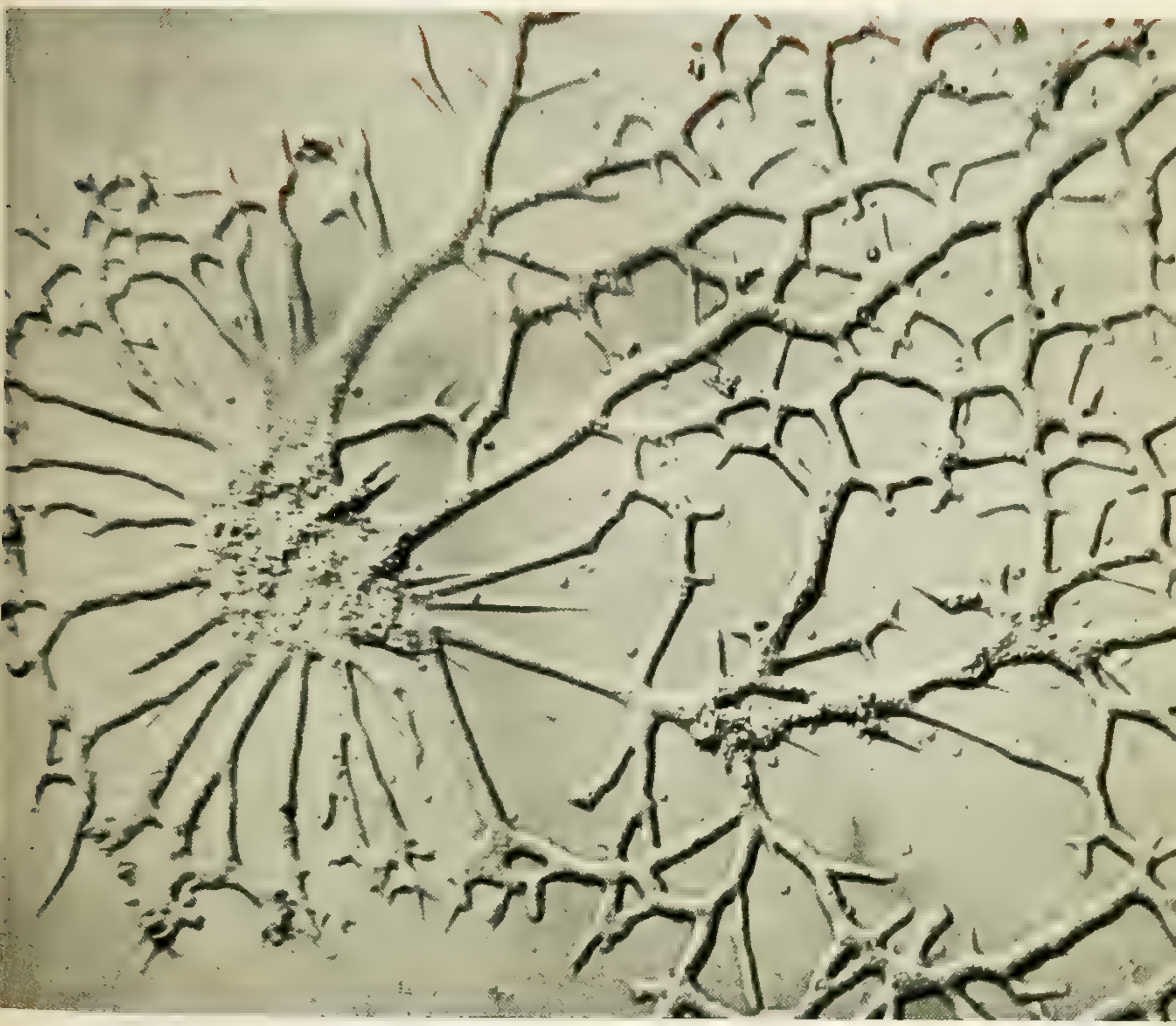

VOL. 48

NO. 569

MAY

1947

PAGES

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

EVENTS DURING MAY AT THE GARDEN

Members' Day

3:30 p.m. in the Members' Room

May 7 ***Adventures in a One-Man Greenhouse*** *Victor Greiff*

Saturday Afternoon Programs

3 p.m. in the Lecture Hall

May 3 ***Action Films of Garden Flowers*** *Allen K. White*
A lapse-time motion picture in color

May 10 ***Plants and their Wanderings*** *W. H. Camp*

May 17 ***Wild Life in the Watchungs*** *Mildred J. Rulison*
As seen at the Trailside Museum of the Union County Park Commission

May 24 ***"Plants and the Life of Man"*** **and** ***"The Gift of Green"***
The Botanical Garden's own color films

The Saturday programs will be resumed in the fall.

Programs for Garden Clubs

Arranged by the Garden's downtown office at 801 Madison Avenue

May 1 ***Tour to du Pont gardens in Wilmington***

May 20 ***Garden Club Day at the New York Botanical Garden***
11:30 a.m. Program in the Lecture Hall
1:30 p.m. Guided tours of buildings and grounds

Museum Exhibits

Flower Paintings by Tabea Hoffman, through May 31.

Fruits of Central America, water colors by Lee Adams, through May 31.

Mushroom Models by Paul Marchand, showing a dozen edible and poisonous species, continuous.

Forthcoming Events

Members' Day: June 4, "Some Native American Herbs and Vegetables" by Helen M. Fox. *Museum Exhibits*: Photographs of English Gardens, date to be announced. Mushroom Models, continuous.

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VOL. 48 MAY 1947 NO. 569

My Garden of Slime Molds

By Ruth N. Nauss

DID you ever see a plant with an animal-like body? My indoor garden is full of them. They are slime molds, which in their native haunts move about freely searching for food; then overnight they change their form into spore-filled fruiting bodies which are of unusual beauty in form and color.

These slime molds inhabit woodlands the world over, creeping between fallen leaves, under bark of rotting logs, and even into the logs themselves, where they are completely hidden from view. Some species also live down in the ground.

Because they are so secretive in their habits, the slime molds are little known and little studied. Fewer than half a dozen of the 300-odd species have had their life histories worked out and recorded. This phase of investigation, however, is one of the most interesting and deserves more attention.

To carry on my own studies of the slime molds, for the past ten years I have been growing them indoors, where they have revealed many an interesting secret. To bring in bags of selected leaves, a little soil or moss from just the right place, and pieces of bark and logs, is somewhat of a gamble, for usually I never see their slime mold inhabitants until weeks, even months, later. And all that time they are taking up space in the apartment, looking like so much material for the rubbish heap.

Gradually, by pushing back the furniture a little at a time, I have acquired one-third of the living-room for my work. Here I do my "gardening," using small jars and glass-covered dishes which are housed in a sectional bookcase. Other equipment consists of a large work desk, the herbarium case, staining table, photographic apparatus, and several small files and record books. You may well wonder how my husband and I can turn around and whether guests may not have to sit on radiators. We like rubbing elbows with the slime molds, though, and feel more than compensated in being able to observe the captivating habits and unusual beauty of these queer animal-like plants.

The spore-bearing bodies, or SPORANGIA, of the slime molds, like myriads

of other minute things, could not be seen in detail until lenses came into use, which was only a little over 200 years ago. Botanists then hunted them out by the score and named them the MYXOMYCETES, meaning literally in Greek "slime molds." Until comparatively recent years, most of the studies on slime molds have been focused on the sporangia, by collecting them, determining the species, and filing them away in some herbarium for future reference. For the most part, sporangia are formed on the surface of the substratum and are therefore seen more often than the vegetating, or moving, "animal" phase.

The Foot-Loose Plasmodium

This vegetating phase that gives rise to the sporangia—what is it like? Fruiting bodies of our common fungi, such as the well known puffballs and mushrooms that also bear spores, have a plant body consisting of tough thread-like strands, some of which can be found rooted, so to speak, in the substratum on which it grows. But slime molds leave no such clear evidence of their manner of life after fruiting occurs, for usually all of their substance is utilized in making the sporangia themselves. In higher plants, this would be comparable to an entire plant roots, stems, and leaves – being transformed overnight into a mass of seeds.

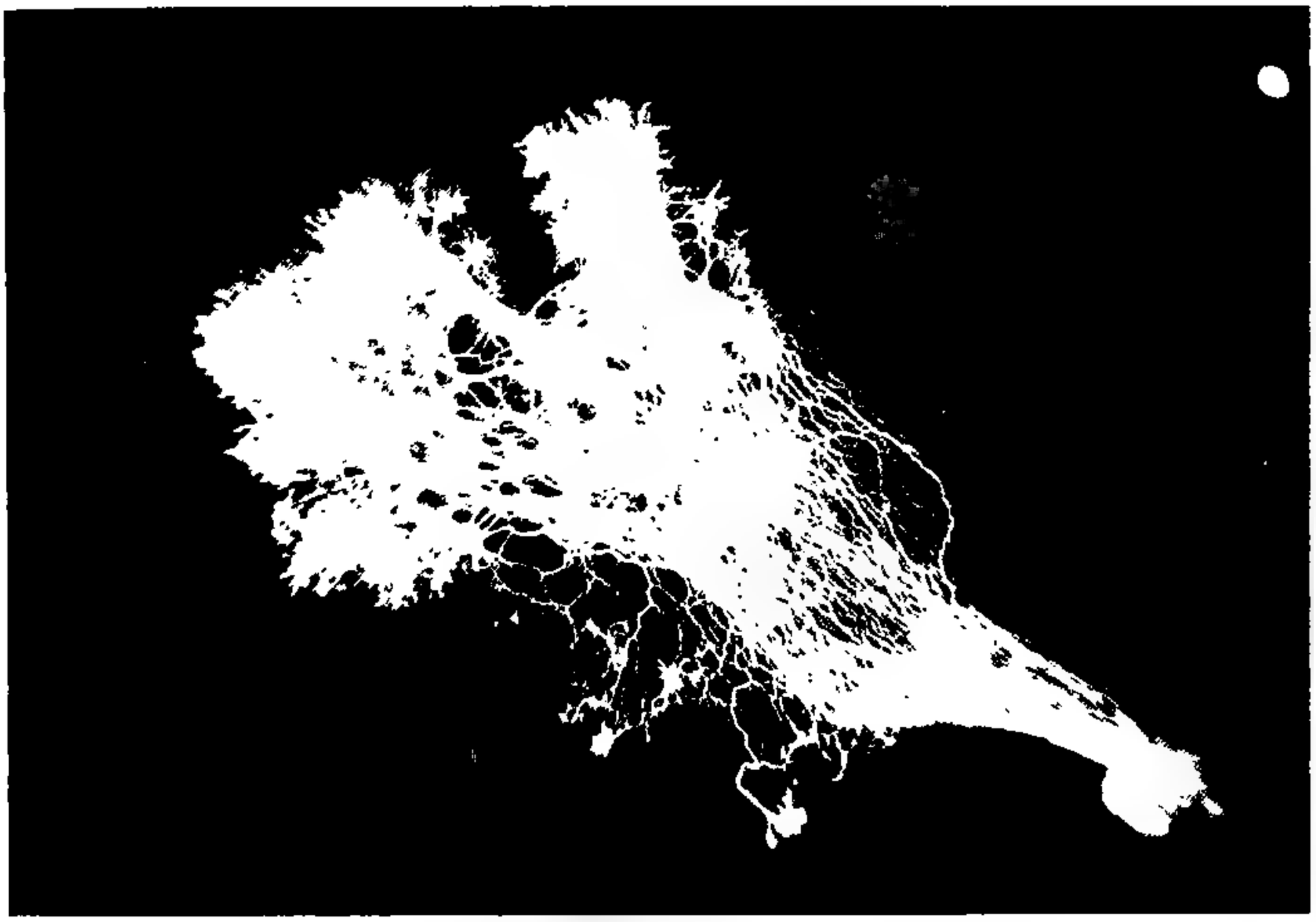
This substance of the growing stage, known as the PLASMODIUM, is a network of gelatinous-like threads, or veins, consisting of protoplasm and ingested food material. It is usually fan-shaped, the curved side being the advancing front. The vein patterns of plasmodia are often exquisitely beautiful and in at least several instances are characteristic of a given species. They slowly but continuously change shape as the plasmodium creeps along. When two contrasting colored species are grown in the same dish and their veins intertwine, they are as delightful to the eye as any of the flowering plants.

Since plasmodia are not attached permanently in any way to their substrata, they ooze about in moist shady places "foot loose and fancy free." Someone has humorously said that their ability to creep as a unit through the tiny interstices of wood seemed as extraordinary as if an elephant could be pressed through the meshes of a screen-door and emerge whole on the other side. The secret is that the plasmodial veins are able to pull apart and later fuse again.

The plasmodium has no protective covering or internal support of any kind. It is formed by the fusing together of many microscopic amoeboid

On the Cover

The fan-like advancing front of this crystal-clear plasmodium, ranked among the handsomest of all species, is scalloped with a border of wheels, one of which is shown at the left.



The varying patterns of this very finely veined white slime mold plasmodium are always attractive to the observer. (Magnified about 30 times)

bodies which come from spores. Unlike spores of ordinary molds, which start their vegetative life by sending out germ tubes which grow, the slime mold spore cracks open and liberates a small colorless body that begins foraging for itself. It propels itself about by a flagellum, a thread-like appendage that also helps it to get food. Later it draws in this flagellum, flattens out, and creeps about like an amoeba. It multiplies itself many times by dividing in two again and again. After a while these little amoebulae get lonesome for each other and begin to collect in groups. Then they unite in pairs and their nuclei fuse. Some authors consider this a sexual phase. Each newly paired form becomes a tiny plasmodium in itself and in turn fuses with others, this time their nuclei remaining separate. Finally, all that have joined together become the multinuclear reticulated plasmodium that is characteristic of slime molds.

The mechanism that enables a plasmodium to creep along is the most remarkable phenomenon of all.* Under the microscope a vein resembles a tiny river carrying sand and gravel, racing to some distant lake or sea. Then suddenly the streaming slows down as though something had been forgotten. It comes to a dead stop, then starts racing back after it. Soon

* See Hagelstein, Robert. "On Preparing an Exhibit of the Life Cycle of the Mycetozoa" in the Journal for June 1936.

the streaming halts again, the forgotten article is apparently picked up, and the little river begins racing forward again. This unique rhythmic ebb and flow is repeated over and over, the flow forward being perhaps five seconds longer than the time spent in retreating. The cumulative effect of this difference in time is sufficient to carry the plasmodium forward at the rate of about one inch in three hours. What causes the protoplasm to ebb and flow is mostly a matter of hypothesis. Several times, under the microscope, I have seen rotifers suddenly stop the streaming by anchoring their two-pronged tails into a vein while they stretched out their bodies and twirled vigorously for their suppers. Streaming started again when the rotifers left.

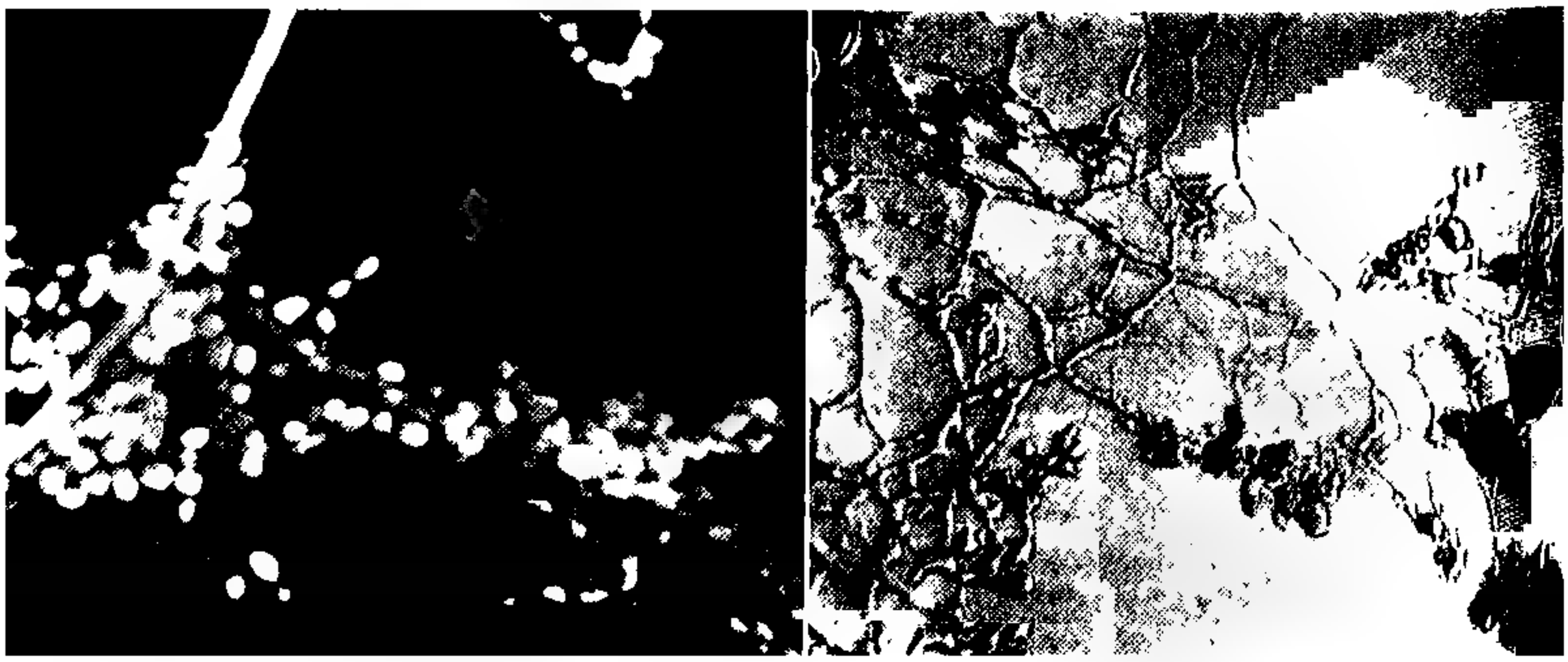
Because the slime molds are so animal-like in these earlier phases, the zoologists have also laid just claim to them and have named them the MYCETOZOA, meaning "fungus-animals." This confusion in classification, however, which stems from that no-man's-land in biology where animals and plants are just beginning to deviate from a common origin, need not perplex those who wish to grow and study them. In fact, it makes them the more interesting. And the commonly employed term SLIME MOLD, used by both botanists and zoologists, bridges the gap very well. It is just as appropriate as either of the higher-sounding names, for it is suggestive of the slimy residue they give off in their vegetative stage. This is one of the outward differences between them and ordinary molds. This slime, which is cast off at the sides of the veins, is usually left in the form of two paralled lines just barely separated, and is the telltale track of where a slime mold has been.

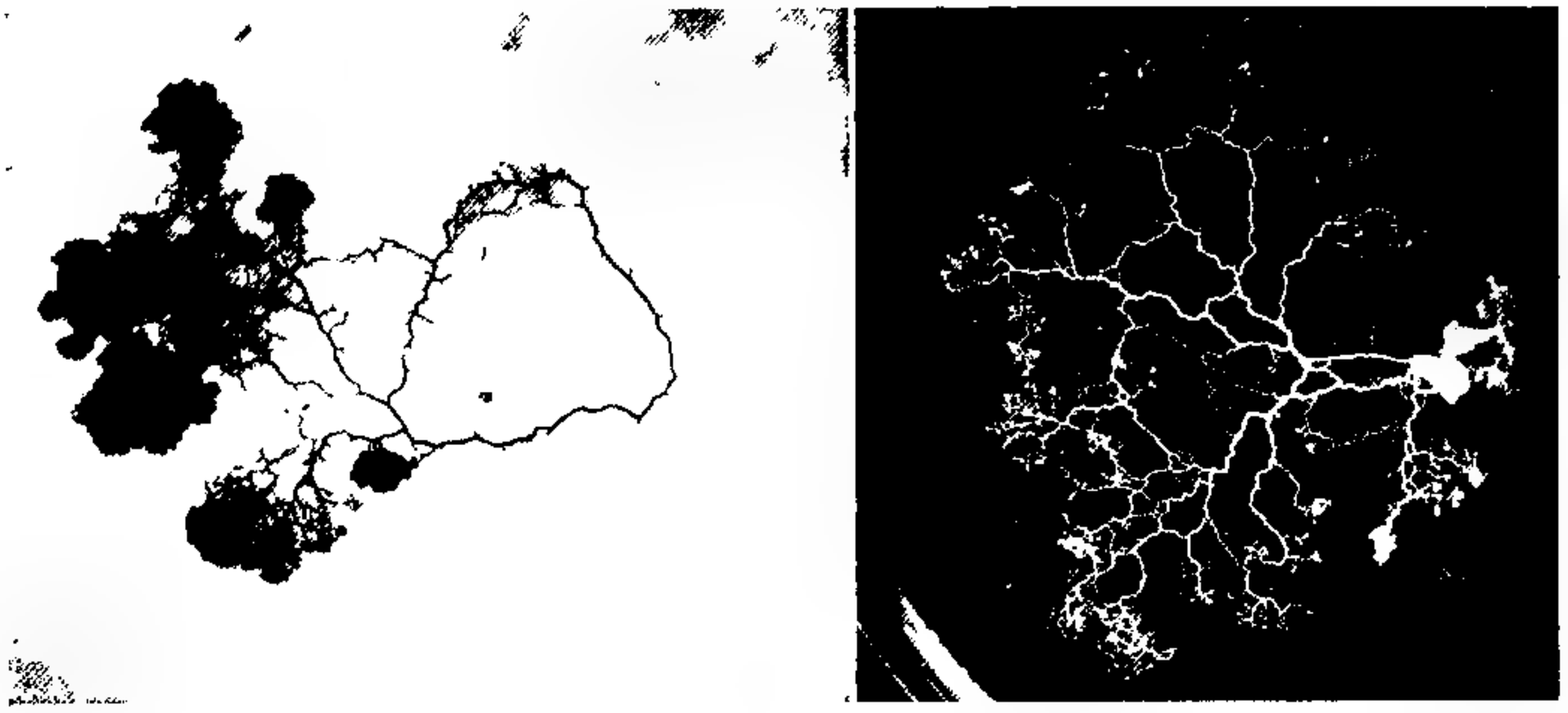
I have never been able to gather satisfactory data as to how far slime molds actually travel in their search for food, for mine are housed in a city apartment where their peregrinations have to be curbed. Some of them

TWO CURIOUS TYPES OF PLASMODIUM

(Both magnified approximately 100 times)

In the noduled white species at the left the protoplasm flows freely from one nodule to the next, even though they appear separated. At the right is a plasmodium of glassy transparency which feeds on microscopic eelworms (nematodes), by quickly surrounding them with "blobs" of protoplasm which spurt out from the slow-moving veins.





CANNIBALISM AND TRAVEL

(Both magnified approximately twice)

The velvety-black plasmodium at the left is a victim of cannibalism practised by one of its fellow slime molds, a white species of delicate texture. At the right is the author's second oldest plasmodium, one which she has kept for eight years without its having fruited. At the rate of one inch in three hours, how far may it have traveled in its series of dishes in this time?

obviously feel confined in their small dishes and if given a chance would grow much larger and travel long distances. I often dream of a glass-enclosed or tile room where they could be kept moist and wander as far as they like. Usually such thoughts come after I fine the big yellow plasmodium streaking across the top of my desk. It has grown hungry in my absence and could not wait till I returned. It is a pretty sight there, its yellow-netted veins outlined sharply against the black, but for its own good (the dry atmosphere would eventually kill it) and for the sake of my desk, it has to be scooped up and put back in its dish, and then the desk top mopped up. Ordinarily, though, my plasmodia are very well behaved. They move round and round their dishes contentedly until they are ready to fruit.

Speaking of distances, however, I wonder how far my two oldest plasmodia have traveled at the one-inch-in-three-hours rate since they were collected eight and nine years ago, respectively. The eight-year-old one is not nearly so fastidious about having its meals on time as is the big yellow one. Sometimes it has gone from six to nine months without any attention at all. It is one of the daintiest plasmodia I have ever seen under the microscope, but it has never borne sporangia during all its life in captivity.

Watching for the Fruiting Stage

Though finding sporangia in my dishes is a common occurrence, somehow it is always a delightful surprise. Some plasmodia are very timid

and bear their sporangia only in darkness; others do not mind the light; and one even seems to prefer it. One evening I found it oozing out from under the lid of its dish. As it was my dinnertime, I turned out the light and left, intending to put it back on my return. But to my surprise it was already back in when I later switched on the light. As I worked at my desk, I noticed that it began creeping out again. Farther and farther it came. I was interested. But about eleven o'clock I began to be sleepy and decided that it was time this plasmodium was retiring also. I lifted up the lid, but as I was about to scoop it up I noticed that its texture had changed; it was now a spongy yellow froth. Suddenly I realized that it was fruiting. I delightedly blinked my eyes open and decided to sit up with it until it had finished, for I did not have the heart to turn out the light which it seemingly needed for this delicate process. While I waited, I took pictures of it as it tumbled over the side of its dish. The one reproduced here shows its tracks in the background of the dish. By one o'clock in the morning the wonderful transformation from plasmodium to spores had been completed, having required about five hours. That was the first and last time I have ever felt compelled to sit up with a slime mold.

One of the timid plasmodia is a beautiful black one. I never get over being surprised when I find its sporangia, for very seldom is its fruiting process observed. Not long ago I was admiring one of these plasmodia that was so black it looked as though black enamel had been spilled on the blotting paper. I knew that it was somewhere near its fruiting time and left it around twelve o'clock. Next morning, outlining where it had been, stood a dozen or so little reddish-black sporangia, resembling Indians at a dance. This plasmodium is one of my favorites, but it is also enjoyed by one of its brother slime molds—for a different reason. This other species relishes the taste of it and feeds upon it till it is all gone. Then I have to give it another black plasmodium, or it will die of malnutrition or starvation. A horrible thought, I grant you, but a fascinating situation to observe.

In one genus there are two plasmodia that can be easily watched during the fruiting process, because they have the peculiar habit of bearing spores intermittently over a long period of time. One of these plasmodia, which belongs to a species that has been considered rare by several workers, produced a few sporangia nearly every day for four and one-half months. The other one bore sporangia for eighteen months without being transferred to another dish.

These are both exceptional records. Since both of these species have beautiful sporangia, it is not hard to realize they stand high in my list of favorites.

Then there is the plasmodium that lives entirely under water, coming

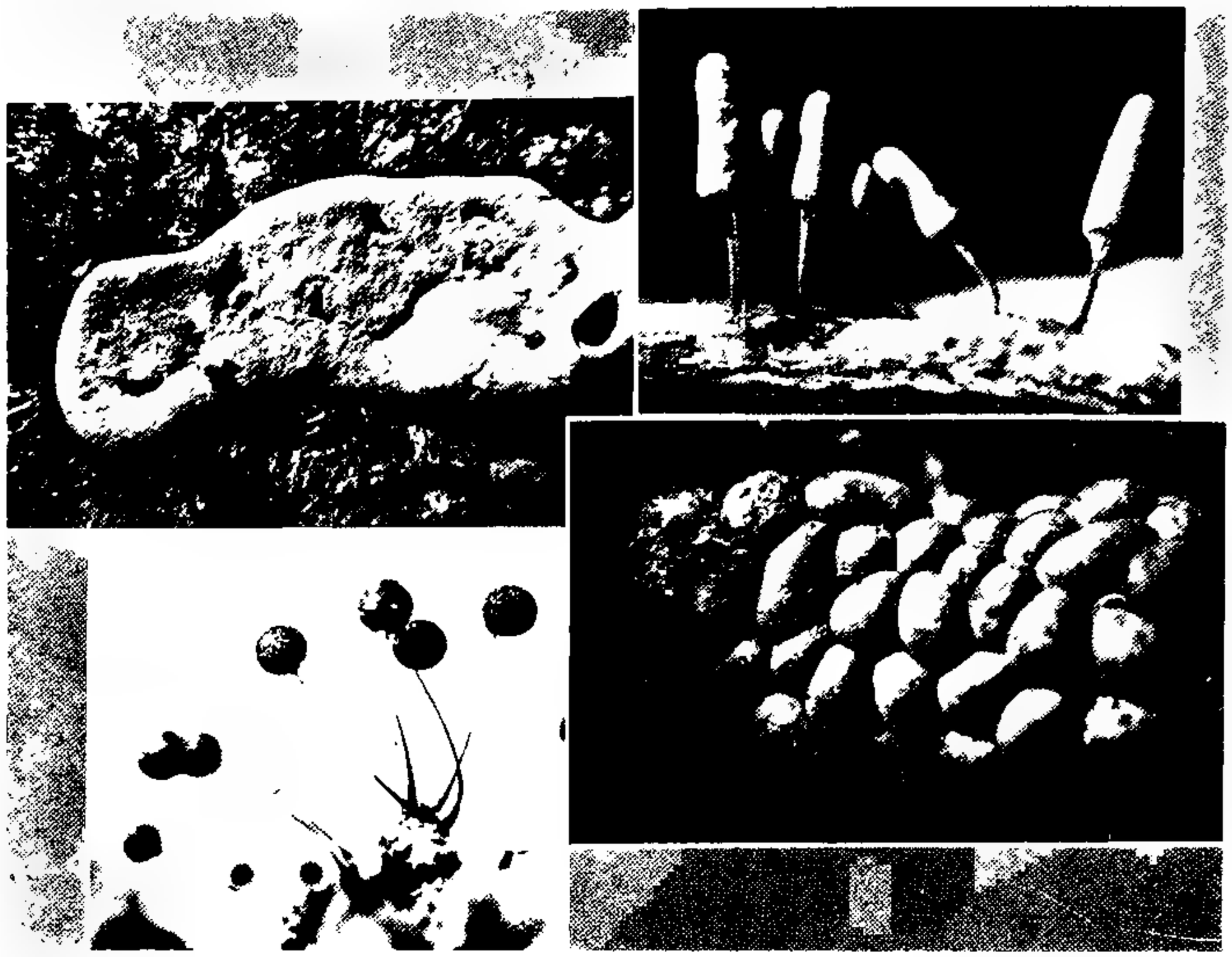
Yellow froth tumbling down from the side of the petri dish, leaving its trail behind it, marked the beginning of the fruiting stage of this previously unidentified plasmodium, which the author sat up late at night to witness.

to the surface only when it is mature and ready to fruit. It likes to creep right next to the surface of the glass under about half an inch of water. It is colorless, transparent, and along in its veins it carries "boulders" of starch grains which are eventually disgorged along the borders. Since it is a very hardy plasmodium, a minimum of attention is given to it. All I have to do to get it started is to soak a few home-grown sporangia in water, and in about ten days plasmodial fans appear.

Managing a Slime-Mold Garden

By now you may be hankering to start a slime-mold garden of your own so that you can observe some of these things for yourself. If so, you have more than half of what it takes for success –interest. As equipment, all you need are a small piece of bark or decaying wood an inch or two long, a piece of paper-toweling, and a glass-covered dish of some kind. Line the bottom of the dish with three or four layers of the paper, moisten it with tap water, and then lay the bark or wood in the middle of it. For the next ten days or two weeks keep the paper well saturated. Ignore the common, ordinary molds that appear; they are just so many "weeds"! But be sure to give a cheer when you see a little bit of colored gelatin ooze out of the wood and creep slowly onto the paper, for that will be a slime-mold plasmodium and your garden will have been started.

Maybe another piece of wood will yield a different colored one: a shade of yellow, vivid orange, brown, salmon-pink, black, white, transparent glass-clear, raspberry red. No matter what the color, you will like it. And



SPORE-BEARING BODIES OF A GROUP OF MYXOMYCETES

(Magnified approximately 20 times)

Upper left is one which forms a single layer of soft brown spores, covered by a thin coating of white lime. At the right, pyramids of gray spores are piled high on the shallow, cup-like receptacles surmounting the stalks. These sporangia arise from a colorless plasmodium that turns pale yellow just before fruiting. Lower left are globular sporangia of jet black, covered by a thin gray shell which falls away from the surface gradually. These come from an opaque white plasmodium. At the right are iridescent yellow fruiting bodies, closely packed and lying directly on the substratum, without stalks. The species vary considerably in external structure.

be optimistic when the wood fails to yield. Try another, or try a few moist decaying leaves lying next to the soil. The woods are full of slime molds.

Now about keeping your plasmodia in good health. They may either be left in the dish with the wood or transferred without it to a fresh dish. Plasmodia that have been isolated from their natural substrata need to be artificially fed. They thrive on rolled oats just as we humans do. Put some through a flour sifter and then through a tea strainer. The resulting particles will be small enough for a plasmodium to ingest. Sift a very small amount in each dish every two or three days and keep the paper moist at all times. Slime molds love shady places, so be kind to them and keep them out of the sun. A temperature that ranges between 67 and 72

degrees F. is a good average, though some plasmodia like more heat than this at times, some less. I usually transfer plasmodia that have been separated from their wood on an average of once every two weeks. This keeps them from becoming overrun with foreign organisms. And when sporangia appear, something like naphthalene flakes should be put in the dish with them while they are gradually drying out, or else by the time they are entirely dry, microscopic mites may have eaten up all the spores. (These little mites and other organisms like the moisture of the dishes and do not contaminate other parts of the house.)

People often ask me what I do with my hundred or so plasmodia when vacation time comes around. I am always glad when they do, for it gives me an opportunity to explain another interesting phase of slime-mold life—one that shows them to be practical as well as beautiful. This is the resting or SCLEROTIAL stage. Without it plasmodia could not live through a very dry spell in summer or the long cold months of winter. How they do this, varies with the species. Many of them sclerotize by drawing in their veins to form a compact mass which turns to cysts. Sclerotia of this type resemble a piece of coral in form and texture. Some other species do not trouble to draw their veins together; they simply divide at very short intervals along the veins, each bit rounding up and forming a cyst. When favorable conditions of moisture and temperature return, the contents of the cysts emerge and fuse to form the plasmodium again.

So, when I go on vacation, I take advantage of this practical aspect and induce some of my plasmodia to sclerotize by deliberately withholding moisture from them several weeks beforehand. Others are able to take care of themselves. But those that are delicate, requiring lots of attention, together with those that are important at the moment for one reason or another, are packed up and taken along. Sometimes the happiest moments of a vacation have been those when one of these special plasmodia has fruited. I recall this happened in Vermont one cold, wet summer. I had been tucking in my plasmodia night after night with a warm water bottle, setting the box in a protected clothes closet, and wishing day after day the rain would cease. Then one day I found that one of these plasmodia had fruited. Evidently the treatment it had been getting was just what it needed to bear its sporangia—not that it had been used to such nursing in its native haunts, however. After that, I didn't care how cold it got or how much it rained, for I had discovered the species of another unknown plasmodium.

And so it goes in growing slime molds—something interesting all the time. This type of gardening can be made both a pleasant pastime and a worth-while study. Although slime molds are not recorded anywhere in the literature as having bitten anyone, I have several friends who apparently are suffering from some kind of slime-mold phobia. They had rather study slime molds than eat, the author not excepted.

The Largest Sequoia East of the Rocky Mountains

By Charles F. Jenkins

PERHAPS no tree on this continent of ours arouses our interest and enthusiasm more vividly than the sequoia, the "Big Tree" of the Pacific Coast. And when we find one growing and apparently thriving here on the Atlantic Seaboard, it is a matter of horticultural comment.

Some three miles northwest of Media, the county seat of Delaware County, Pennsylvania, and about 18 miles west of Philadelphia, is an old arboretum established about 1800. Two brothers, Jacob and Minchell Painter, during the years made a collection of unusual trees and shrubs and devoted their lives to what came to be called "Painter's Arboretum." It eventually came into the possession of a relative, John J. Tyler, who in his will directed the establishment of a public arboretum.

Mr. Tyler died within thirty days of making his will, thus making void this philanthropic bequest. However, Mrs. Tyler, his widow, conforming to his wishes, founded the arboretum in 1933. It was renamed the "John J. Tyler Arboretum" and in 1946 announcement was made of the addition of 600 acres to the property. There is an endowment of $400,000.

Several of the treasures planted by the Painter brothers are still standing, and among these none attracts more attention than the California Big Tree—*Sequoiadendron giganteum* (*Sequoia gigantea*).

If the Painters kept records of the source of their accessions, they make no note as to the origin of this exile tree. There was a tradition told me years ago that a returning covered wagon, coming from California and passing through the nearby town of Chester, dropped a little plant which no one knew and which was turned over to the Painters. It was planted on a sandy knoll some distance from their house and there it stands to this day. No one knows its age. It is said that vandals have twice cut out the leader for Christmas tree purposes and it was once struck by lightning. It now has a lightning rod on it.

Its trunk now has a circumference of 7 feet 9½ inches, four and a half feet from the base of the tree. The spread of the branches east and west is 21 feet and 23 feet north and south. It has not been measured for height but it is approximately 40 feet.

Neglected and comparatively unnoticed for many years after the death of the Painters, the Big Tree has now become an object of great horticultural interest. This interest will be increasing as the arboretum is developed and publicized by the present board of trustees.

As the Tyler Arboretum is off the main road, prospective visitors should

CALIFORNIA BIG TREE IN THE TYLER ARBORETUM

Believed to be the largest sequoia east of the Rockies, this tree is of unknown age and origin. It is thought that it was planted there by the Painter brothers early in the 1800s.

Photograph by courtesy of John C. Wister.

ask for the little village of Lima not far from Media and there inquire for specific directions. When in the arboretum, they should not fail to see the other old trees and shrubs planted by the Painters, leaving for icing on the cake a visit to what is thought to be the largest sequoia east of the Rocky Mountains.

The Brooming Disease of Walnut

By B. O. Dodge

DURING the summer of 1942 several curious witches' brooms developed on a young Japanese walnut tree, *Juglans Sieboldiana,* near the gate house at the New York Botanical Garden. These brooms consisted of numerous proliferations or sprouts at points along the larger branches and even at the ends of branches. The leaves at these points were much dwarfed and otherwise deformed.

On other trees, hackberry among them, somewhat similar witches' brooms have been caused by mites, but on these, no fungi, bacteria, or mites that could have stimulated such excessive growths were discovered. Larvae or nymphs of spittle bugs were found on some of the branches and occasionally at the base of young brooms, so it was thought that these insects might have caused the disease.

The walnut brooms were pulled off from time to time for study, and during 1943 no new brooms developed. However, during 1945 about a dozen new brooms appeared on the lower, more horizontal branches and a larger one on a side branch from the main trunk near the top. This one is shown here as it appeared in the fall of 1945. During the early summer of 1946 many new brooms developed all along most of the limbs. Large masses of dwarfed and deformed leaves and flower clusters joined in making up the witches' brooms. The dried pistillate inflorescences still persist (March 1947).

The abstract of a paper presented at the Cincinnati meeting of the American Phytopathological Society Dec. 28-30, 1946, by Dr. Lee M. Hutchins of the Bureau of Plant Industry, Division of Forest Pathology, and Horace V. Wester, U. S. Department of the Interior, gives us the probable explanation for this disease.[1] They had observed it on walnut and butternut for several years in the eastern states, and had proved that it

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[1] Phytopathology 37: 11, 1947.

The large witches' broom as it appeared on the Japanese walnut at the Botanical Garden in the fall of 1945, three years after the majority of the brooms first observed had been removed for study. This same year (after none appeared in 1943), a number of smaller brooms developed on the lower, more horizontal branches.

could be transmitted by grafting. They say in their paper: "Transmission of the brooming disease by grafting and absence of a visible pathogen indicate a probable virus causation."

The following quotation from a letter dated Jan. 17, 1947, from Dr. Hutchins is self-explanatory.

> "It was indeed a pleasure to receive your letter of January 13. The excellent photograph of brooming in *Juglans Sieboldiana* is a perfect picture of what we have been seeing in the vicinity of Washington in Japanese walnuts, and is typical of the disease that we transmitted by grafting, as reported in the paper by Hutchins and Wester at Cincinnati. I should say without question that it is the same disease. I appreciate the trouble you have taken in writing me about it and in furnishing me with such a fine illustration."

The second photograph, the one referred to in the above quotation, shows this tree at another angle as it appeared in November, 1946, after a large number of brooms had developed during the summer. It is clear that the new broom shoots grow up vertically instead of at the normal angle. In thus being strongly erect they are like the suckers of peach trees affected with the yellows virus.

Since this walnut disease is evidently caused by a virus and is therefore systemic, it follows that if one has a planting of walnuts or butternuts the only sensible procedure is to remove completely any tree showing these witches' brooms.

The same tree in the fall of 1946. The erect nature of the branchlets involved in the broom growth should have suggested a virus origin for the disease.

BROADCAST

By José Garrido Torres

ONLY a day's airplane journey away from New York lies one of the largest and potentially richest countries in the world—Brazil. With the beginning of war, the United States became increasingly dependent upon the productive lands of its South American neighbor for certain oils, waxes, fibers, medicines, and foods of vital importance to its industrial economy. Many of these products were described on the New York Botanical Garden's bi-weekly radio program Oct. 2 by José Garrido Torres, the Assistant Director of the Brazilian Government Trade Bureau in New York. Below are given some selected passages from the script.

Plant Products From Brazil

IT has been estimated that about one-fourth of all the species of plants known in the world grow wild in Brazil. In addition to the useful kinds among the native species, there are great possibilities for the cultivation of crops that have been imported from other countries, such as coffee. Brazil has long been the world's greatest coffee producer.

Of native Brazilian plants under cultivation there are many, and the commercial importance of some of the waxes and oils particularly is increasing year by year, as the industries are gradually being built up. A number of these oils and waxes come from palm trees. For example, five different kinds of palm yield oils that are used in making soap; four kinds provide pleasant-tasting vegetable oils that are used for margarine, and another a medicinal oil. Seven additional palms are used as food. The fruit of the TUCUM palm (*Astrocaryum vulgare*), for one, is eaten by the natives, while an oil for soap-making and for margarine is extracted from the seed kernel.

Palms Giving Waxes and Oils

So far, the CARNAUBA palm (*Copernicia cerifera*) is the most important. In fact, the natives call it the "tree of life" because they use it for so many purposes. The wax from its leaves is exported to 22 foreign countries, and it is bringing Brazil an annual income of nearly 300 million cruzeiros, or about $14,500,000. Carnaúba wax is used for almost everything for which a hard, fine wax is needed—phonograph records, waxes for polishing automobiles, insulating material, carbon paper (it prevents the carbon from smudging the fingers), salves and unguents, lubricants of certain types . . . and for many other products.

When the war began, BABASSU (*Orbignya speciosa*) acquired special significance for people in North America, because the oil from its seeds took the place of coconut oil from the Pacific in the making of soap.[1] Babassú palms grow in dense stands in the wild, chiefly in the north and central parts of the country. Harvesting consists merely of picking up the nuts from the ground, and a single tree will produce an average of 800 nuts a year.

LICURI, or OURICURY, (*Syagrus*, or *Cocos, coronata*) is one of the newest palm nuts to be exploited in Brazil. In the 1930's, it was almost unknown outside of Brazil itself. When it was realized that the nuts yielded a valuable oil and the leaves a useful wax, exportation of licurí products leaped from a value of Cr$3,000 in 1937 to a thousand times that figure in 1941, and the increase is still continuing.

Of all the palm trees yielding oil and wax, these three—carnaúba, babassú, and

[1] See the Journal for June 1946 for a report of the broadcast, "Vegetable Oils That Make Fine Soap" by Georgia Leffingwell.

licurí, or ouricury—are the only ones whose products are exported. But there are great future possibilities for the commercialization of other palm trees—and of other kinds of trees, too. There are at least 17 other species with fruits that contain an oil that makes a fine lather. The OITICICA (*Licania rigida*),[2] is of even greater commercial importance. Its oil has too strong an odor for soap, but it can be employed in paints and varnishes—and is especially valuable there because it dries so quickly. During the war it played an important role as a substitute for the tung oil which had formerly been coming from China. American enterterprise is responsible for the development of the oiticica trade.

Plants Used in Medicine

In America a number of Brazil's medicinal plants are used, ipecac and sarsaparilla, for instance. Others are known in Brazil alone. Some are more familiar in their alternate roles of food, flavoring, or drink. The CUMARU, or tonka bean (*Coumarouna odorata*), for example, has a flavor like vanilla, and it is used both in bakery goods and perfumery, as well as in medicine. GUARANA (*Paullinia cupana* or *P. sorbilis*) is a stimulant, which is best known as a refreshing drink containing large amounts of caffeine. It is especially good as a cold drink, sometimes carbonated, more or less taking the place of the cola drinks of North American soda fountains. Arrowroot (*Maranta arundinacca*) used in arrowroot biscuits, is another native product—not exactly a medicine, but a starch so easily digested that it is recommended for infants and invalids.

Foods and Beverages

When Brazil exports food products they are mostly from plants that have been first imported from other countries. In the past few years, for example, rice has been exported.

While cocoa trees grow wild in the Amazon valley, they are an introduced crop in the State of Bahia, along the Atlantic coast, where more than 95 percent of the country's output is grown commercially. Brazil is the world's second largest producer of cocoa, the Gold Coast of Africa being first.

Brazil grows considerable tea, too, as well as MATE (*Ilex paraguariensis*). While enough tea is grown to allow for small exports, more than 50,000,000 kilos of maté are exported in a year—the bulk of it to Argentina and Uruguay, where it is most enjoyed. It is only in recent years that people in the United States have begun to appreciate maté as a beverage.

Citrus fruits are one of Brazil's leading crops. The navel orange was first discovered in a Brazilian orchard, and from there was carried to California. Brazil's export crop of oranges has grown to a 50 million cruzeiro business annually, and the value of exported grapefruit is even higher. Brazil, like California, has an ideal climate for these citrus fruits. Bananas too can be grown in nearly every part of the country. About 90,000,000 bunches are produced in a year, of which approximately 10 percent are exported. Pineapples, which are native in Brazil, bring an annual income of 26 million cruzeiros (or about $1,250,000), of which 10 percent is accounted for in exports.

Vegetable Ivory

There are, of course, many other products, among them the plants which give us important insecticides, also the fiber plants and timber trees, and the brazil and cashew nuts, both of which are native in Brazil. One remaining palm of interest is the vegetable ivory (*Phytelephas macrocarpa*) which grows in the Amazon valley. The seed that it produces is so hard that it can be worked and carved much the same as animal ivory. For buttons and such things it is highly satisfactory. But this, like many other Brazilian industries, is still in its infancy. Also like others, its future is highly promising.

[2] See the Journal for October 1946 for an article by George S. Jamieson on "The Oiticica Tree of Brazil and the Oil from its Seeds."

Sir William Hamilton's Third Volume

SEÑORA TERESA SPENCER, of Habana, Cuba, is part-owner of a curious manuscript book, which she brought to the Garden to show one day. It was written by Sir William Hamilton, M. B., an English physician who traveled and collected in the West Indies about 125 years ago. It purports to be the manuscript of a proposed work on the flora of the West Indies.

Hamilton published in 1825 a short work entitled *Prodromus plantarum Indiae occidentalis,* which may be seen in the library of the New York Botanical Garden. The library also contains two volumes of manuscripts and fragments by the same author, one entitled *Specimena et icones plantarum,* the other *Icones et fragmenta plantarum.* These are an extraordinary jumble of assorted plant specimens, letters from famous botanists, newspaper clippings, and bits of manuscript.

Hamilton was evidently planning a much more extensive treatment of the West Indian flora, and the manuscripts in both Sra. Spencer's volume and in those of the New York Botanical Garden are fragments of this work. They are written—or rather hand-printed—in a minute and meticulous hand in red and black ink; red being used for the parts (as *corolla, caulis,* etc.), and black for the characterization of these parts. They are neither continuous nor complete, even if one attempts to collate the two collections.

The Spencer volume begins with the title *Conspectus florae Indiae occidentalis, Vol. III.* There are 97 pages of this, followed by an appendix consisting mainly of copies of Hamilton's botanical correspondence. Then, on a different size, comes a printed sheet bearing the title *Conspectus florae Indiae occidentalis: or catalogue of plants growing in the West Indian Islands, and upon the adjacent coasts of America;* etc. After this are 383 pages of manuscript descriptions with about 100 pages of Index. This includes "Vol. III" above, but is nowhere identical with it. The manuscript in the New York Botanical Garden copies also covers some of the same ground as this above, but differs in many respects from it. Hamilton evidently started his work many times, or attempted to improve on it with each succeeding version.

Among the miscellanea in Sra. Spencer's copy are newspaper clippings on such subjects as locomotive engines, a hen with a human face ("the animal appeared fond of the society of men and shunned that of fowls"), the tyranny in Lisbon and the arrest of a Portuguese lady for playing the national constitutional hymn on the piano-forte, a method for destroying wasps, the moving of a large weeping-ash to Chatsworth, the Plymouth blanket society ("the blankets cost seven shillings each"); a ticket (6d) to a meeting of the National Anti-Corn-Law league at Plymouth (Hamilton lived at Plymouth after his return from America); part of a number of Loddiges' *Botanical Cabinet,* January 1823; and letters from William Salisbury, John Reid, some official at Kew, Desvaux, Lambert, and others.

In many places on the otherwise blank facing (left-hand) pages, descriptions are written in which duplicate those of the printed *Prodromus.* These were evidently added later, together with some modifications of the classification, which shows that the preparation of the larger work goes back farther than that of the *Prodromus.* and that the publication of the latter was secondary, perhaps a compromise. The *Prodromus* has worried botanists (for example, Ignatz Urban) because its descriptions were so brief (its author not being a sufficiently qualified botanist) and Hamilton's specimens (in Desvaux' herbarium at Paris) so fragmentary and hard to come by that it was often impossible to dispose of his many new species and even genera. With the aid of these additional descriptions in manuscript and especially the specimens preserved in the New York Botanical Garden library, it may be possible to resolve some of these doubts.

Sra. Spencer's volume was at one time in the library of Leonardo del Monte in Madrid; later it formed part of the collection of the Casino Español of Habana. This library was despoiled of most of its treasures during ensuing years, and the volume in question disappeared. A rumor of its existence, but no more, reached the Director of the Biblioteca Nacional. Finally it was picked up in a second-hand shop in Cuba.

NOTICES AND REVIEWS OF RECENT BOOKS

Practically All . . . A Cyclopedia For Growers of House Plants

ALL ABOUT HOUSE PLANTS. Montague Free. 329 pages, 17 pages in color, 32 in halftone, line drawings, index. American Garden Guild, Inc., and Doubleday & Co., Inc. 1946. $3.50.

The only objection this reviewer has to the book concerned is its name. To be sure, Montague Free is Montague Free, a well known expert and one who has had a lifetime of knowledge of plants and their culture—yet, his title suggests omniscience and omniscience is not attainable by mortals. Even here, there are plants omitted which might justifiably have joined this gay throng.

Having said this, it is now in order to say that this a "swell" book, with many good illustrations. There is hardly a fault to find with it, so careful is it in all points of cultivation: planting, transplanting, soils, fertilizers, light, air, watering, propagation, and all the thousand and one other sides to growing plants indoors. It goes into the subjects with utmost carefulness and should be a cyclopedia for the house-plant grower, beginner or old-timer.

Many points are dwelt upon: the need for rest for house plants, so little understood by most amateurs; the help given by knowing where the plant concerned comes from, so that understanding its reaction to different conditions will help toward success; the necessity of bringing in house plants from their summer outing early, after Labor Day, he says, so that they may become used to indoor conditions before the winter heat is on. This is a suggestion this reviewer has been proclaiming early and late for many years —together with a late date, middle to end of May, for the outdoor parade.

The author knows that certain plants will submit to two drastically different methods of cultivation. For instance, calla lilies when used for the garden after a winter of bloom, must be taken up early and dried off for several months before being potted for winter work, yet plants of this same kind, called arums in England, are grown in English gardens sometimes year after year in a foot of water, with no drying at all. He suggests that the low winter temperature takes the place of the drying rest.

Above all, he aims fiercely a few shots at the worst fault of the house-plant grower when he says: "Be unkind to weak sisters. It is a good place to become hard-boiled at moving time and consign to the compost pile all those plants which because of ill health, are no longer decorative. If they did not recover during their vacation outdoors, they are not likely to improve when brought inside." This hits every amateur grower—or nearly all.

I have heard the criticism that many plants are included which need greenhouse care. Mr. Free does not say that all house-plant growers can grow all these plants. He divides the amateurs into classes and the plants also; but in going through the lists carefully it seems to this reviewer that, given good house conditions (not impossible) and a truly scientific-minded amateur, good results could be expected. Few of us can grow ferns from spores, yet it is done—and so with other subjects. He omits calceolarias, carnations, ericas, mahernias and others, which seem impossible for house conditions.

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The story is told simply, almost colloquially, in understandable language. All in all, this book is heartily recommended to anyone who aims to grow good house plants.

SARAH V. COOMBS.

The Question of Soil Acidity

pH AND PLANTS. James Small. 216 pages, indexed, charts. D. Van Nostrand Co., 1946. $4.

Although the subtitle of this book reads "An Introduction for Beginners," to get the most out of the book the reader should have a knowledge of general physical and chemical terms and their application. The book should prove valuable to those who are familiar with the concept of pH and its relationship to plants and plant growth. The several chapters deal with the pH scale and methods used to measure or determine pH, and the relationships and effects of pH on buffers, carbon dioxide in plants, cell walls, protoplast, plant enzymes, aquatic life, soil pH and plants, plant pathology, succulents, and cytoplasmic life.

The chapter on "Soil pH and Plants" may be of practical value to some individuals. The effect of pH on the action of micro-organisms in the soil is briefly described. Of interest to many will be the pH growth ranges of many kinds of plants listed according to their acidic or basic pH preferences for optimum growth. For those who wish to pursue the subject further, an excellent appendix of about 300 papers is included. The appendix also includes additional discussion of pH and hydrogen ion activity, and the dissociation of acids. On the whole this book presents a good picture of this subject as related to plants.

C. L. W. SWANSON, *Chief Agronomist, Connecticut Agricultural Experiment Station.*

Texas Flora

FLORA OF SOUTH CENTRAL TEXAS. R. G. Reeves & D. C. Bain. 298 pages, indexed. The Exchange Store, A. & M. College of Texas, College Station, Texas. 1946. Lithographed, $3.90.

The specific region covered by this flora includes the following counties of Texas: Lavaca, Colorado, Guadalupe, Caldwell, Bastrop, Lee, Burleson, Milam, Grimes, Robertson, and Madison. Keys to families, genera and species with simple and concise descriptions are included, as well as a glossary for the more difficult terminology.

The purpose which the authors had in mind, namely, that of preparing a manual for the teaching of elementary courses in plant taxonomy, has been admirably fulfilled. The simplicity of the key, the inclusion of popular names and of cultivated plants growing in this region, the conservative manner in which varieties are treated, as well as such simple and clear explanations as appear, for example, in the description of the family Capparidaceae: "In the following representatives a small appendage is associated with the base of the ovary and is regarded as a prolongation of the receptacle," render the manual especially desirable for student use.

It would seem, however, with the original purpose in mind, that it would be better to have treated the grasses more fully since the more extended works in

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existence on the grasses of Texas are available to the average student usually only for referenqe.

SR. MARY CLARE METZ, C.D.P.,
Our Lady of the Lake College,
San Antonio, Texas.

In Paper Covers

KEYS TO SPRING PLANTS. W. C. Muenscher and L. C. Petry. 32 pages, indexed. Comstock Publishing Co., Ithaca, New York. 1946. 50 cents.

Two able botanists provide a simple key for the spring plants which are common in the region of Cornell University.

IT IS EASY TO GROW HERBS. Bunny and Phil Foster. 32 pages, illustrated. Laurel Hill Herb Farm, Falls Village, Conn. 1946. 50 cents.

A book about herbs is always popular. This one is made helpful with life-size drawings of the seedlings.

FLOWERING TROPICAL TREES. Edwin A. Menninger. 44 pages, illustrated, indexed. Stuart Daily News, Stuart, Florida. 1946. $1.

A catalog which is practically a descriptive guide to the flowering trees that can be grown in Florida, with botanical names correctly spelled, and with an attractive cover showing *Tabebuia argentea* in full color.

Gardeners' Book Club

Also in paper covers is an interesting series of booklets put out by *Organic Gardening* at Emmaus, Pa., and more recently taken over by the Devin-Adair Company of 23 East 26th Street, New York 10, N. Y. The series so far includes the books which are briefly mentioned below.

FLOWERS FOR EVERYONE. Heinrich Meyer. 32 pages, illustrated. 1946. 25 cents.

A simple guide with types of flowers tabulated for height, color, and flowering time.

WEEDS AND WHAT THEY TELL. Ehrenfried Pfeiffer. 94 pages, illustrated. 1945. 25 cents.

Obnoxious plants in the garden are classified as weedy weeds, poisonous weeds, pleasant-looking weeds, good weeds, dynamic plants, and in other cate-

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gories. The dandelion is an example of a dynamic weed.

EDIBLE PLANTS OF THE POND AND WATER GARDEN. G. L. Wittrock. 62 pages, illustrated. 1945. 25 cents.

A familiar story, which makes things of the wild more interesting and valuable to the nature lover.

SUNFLOWER SEED — THE MIRACLE FOOD. J. I. Rodale. 39 pages, illustrated. 1945. 25 cents.

A sceptic will think that the pronounced value of sunflower seeds as food is scarcely worth the trouble it takes to eat them.

LUTHER BURBANK. Roger W. Smith. 48 pages, illustrated. 1945. 25 cents.

A brief biography, evidently based as much on current myth as actual fact in Burbank's life.

THE COMPLETE MODERN GARDEN HERBAL. Robert O. Barlow. 94 pages, illustrated. 1945. 25 cents.

Each of 35 common garden herbs is illustrated. More space is devoted to medicinal use than to culture.

ROOT DEVELOPMENT OF VEGETABLE CROPS. John E. Weaver and William E. Bruner. 64 pages, illustrated. 1945. 50 cents.

Charts and illustrations show the extent to which the roots and rootlets of common vegetables will reach in the earth, and how the size and development of roots are related to cultural practices.

Technical Papers

THE GENUS CYPERUS IN MEXICO. Brother Benedict Ayers. 100 pages, indexed. Catholic University of America Press, Washington, D.C. 1946. $1.25.

Keys and descriptions of 88 species, with a list of specimens cited.

THE VEGETATION OF SAN JOSE ISLAND, REPUBLIC OF PANAMA. C. O. Erlanson. 12 pages, illustrated. Smithsonian Institution, Washington, D.C. 1946. 15 cents.

Photographs and a map enliven the text concerning the plants which grow on a small island belonging to Panama.

AMERICAN SPECIES OF AMELANCHIER. George Neville Jones. 100 pages, illustrated, indexed. University of Illinois Press, Urbana, Ill. 1946. $1.50 paperbound; $2 cloth.

A long awaited monograph, amply annotated, and clarified with 23 plates.

UTILIZATION OF SEAWEEDS FROM THE SOUTH ATLANTIC AND GULF COASTS FOR AGAR AND ITS DECOMPOSITION BY BACTERIA. Duke University Marine Station, Bulletin No. 3. 80 pages, illustrated. Duke University Press, Durham, N. C. 1946.

A technical report on the subject of seaweeds and their uses. (For a popular account see the Garden's Journal for January and February 1946.) The bulletin contains the following articles: Introduction to Agar and its Uses; Influence of Environmental Factors upon the Growth of *Gracilaria confervoides; Gracilaria confervoides* as a Source of Agar; Preparation of an Agar-like Gel from *Hypnea musciformis;* Suitability of Extractive from *Hypnea musciformis* for the Cultivation of Micro-organisms; Marine Agar-digesting Bacteria of the South Atlantic Coast; and Three New Agar-digesting Actinomycetes.

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Notes, News, and Comment

International Rules. For the first time since amendments were passed in 1935, the International Rules of Botanical Nomenclature are available to botanists in a complete and up-to-date edition. They appear in No. 1 of Vol. 6 of *Brittonia*, issued April 9.

Collated by W. H. Camp as chairman of the committee on nomenclature for the American Society of Plant Taxonomists, with the assistance of H. W. Rickett, Editor of *Brittonia*, and C. A. Weatherby of the Gray Herbarium, Harvard University, this publication assembles all the rules in comprehensive form. The 1935 edition, published shortly before the International Botanical Congress met in Amsterdam, was not only out of date but out of print. Because the war prevented the 1940 meeting of the Botanical Congress, the complete list of conserved generic names had never been published in one place. The Rules were originally established at the Congress in Vienna in 1905, and were amended at subsequent Congresses in Brussels (1910), Cambridge (1930), and Amsterdam (1935).

The new publication includes, in addition to the original rules and their amendments, a series of apendices containing regulations for determining the types, conserved names of families and of genera by families, plus an alphabetical index to these more than 2,000 names. There is also an appendix on the nomenclature of garden plants and a supplement (prepared by A. S. Hitchcock and M. L. Green and originally published in 1929) on the standard-species of Linnaean generic names among the flowering plants. A subject index concludes the work.

Published by the New York Botanical Garden in co-operation with the American Society of Plant Taxonomists, this "unofficial special edition" was issued as a service to members of the society.

Radio. Dr. Harold E. Anthony, Curator of Mammals at the American Museum of Natural History, who was to have been the Garden's guest speaker over WNYC on March 19, appeared instead on Alma Dettinger's program "Other People's Business" on WQXR April 7 at 11 a.m. Dr. Anthony spoke on the Vernay-Nyasaland expedition of which he was a member and on which Leonard J. Brass, who is now in Florida, collected plants for the Garden.

Edward Steichen, who was to have opened the Garden's spring series of programs over WNYC, was guest on the Jinx Falkenburg-Tex McCrary hour on WNBC at 8:30 a.m. April 9. The interview was based jointly on his work as director of combat photography in the Pacific with the United States Navy during World War II and on his breeding of delphiniums.

Elizabeth Hess, English horticulturist, who spoke on "Gardening in Great Britain Today" at the New York Botanical Garden's Saturday program of March 29, was the guest on Alma Kitchell's radio program on WJZ at 2:15 p.m. March 25.

Lectures. Dr. A. B. Stout lectured on "Data on the Heredity of One-way Hybridization" April 16 to the Torrey Botanical Club, and on April 28 to the Mamaroneck Garden Club on the subject of Daylilies.

The Torrey club, in a joint meeting with the John Burroughs Association April 7 heard Rutherford Platt speak on "The Tree of Life."

Dr. William J. Robbins delivered the second annual John Muirhead Macfarlane Memorial Lecture sponsored by the Bo-

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tanical Society of Pennsylvania at the University April 12 on "Basidiomycetes as Possible Sources of Antiobiotic Substances."

E. J. Alexander addressed the John Burroughs Garden Club in Yonkers April 16 and the Working Gardeners of Bronxville April 22 on the subject of Wildflowers.

Dr. H. N. Moldenke lectured on "Plants of the Bible" on March 23 to the Bronx chapter of the Zionist Organization of America, and on March 26 to the Summit, New Jersey, Garden Club. April 11 he addressed the Elizabeth Garden Center of New Jersey on "Treasures of the Watchungs."

T. H. Everett spoke on "Horticultural Judging" to the judging school of the Pittsburgh Garden Center and the Garden Club Federation of Pennsylvania at Pittsburgh March 25.

Elizabeth C. Hall spoke on April 8 before the Horticulture Club of New York School of Applied Agriculture at Farmingdale, Long Island, on "Horticultural Hospital Therapy."

Joseph F. Burke gave an illustrated lecture to the New York Microscopical Society Jan. 3 on "The Photomicrography of Diatoms—Good and Bad."

Groups. Eighty-one members of the Ninth District of Federated Garden Clubs of New York State met in the Members' Room April 21. Brief remarks were made by Dr. William J. Robbins, followed by a showing of "The Gift of Green" with Dr. E. E. Naylor as commentator. After lunch Dr. Naylor and E. J. Alexander led the group on a tour of the conservatories.

The Woman's Club of Maplewood, New Jersey, met in the Members' Room for a box luncheon April 22. In the afternoon G. L. Wittrock guided the 45 members through the Rock Garden and Conservatories.

Twenty-five students from the Jean Morgan School of Art in New York sketched in the Conservatory March 28.

Forty members of the Garden Club of America had lunch in the Members' Room and later were escorted through the main conservatory by E. J. Alexander and G. L. Wittrock on Jan. 8.

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Vegetable Gardening Must Go On!

A Message from an Amateur Gardener

SEVERAL years ago, the world's scarcity of food made the Victory Garden a serious necessity. Today, this condition is somewhat relieved, but we can be sure that the ending of the war has not obviated the need for a supplement to the food supply. As long as we know of continuing want in our sister nations, our conscience should direct us and our common sense confirm the wisdom of our Government's suggestion that we continue to grow vegetables.

Aside from this acknowledged need, many amateur gardeners like myself, who have been raising table crops for the past five years, again plan to grow our own vegetables because of their downright goodness, and also because of the satisfying pleasure we derive from working in the garden and watching our plants develop. To us, a patch of healthy, maturing vegetables is a constant reminder of the strong force behind Mother Nature that is always serving us.

All the family joins in the fun of gardening and appreciates that the flavor of freshly picked lima beans, crisp lettuce, a juicy tomato, or an ear of corn that is still "in the milk" is all the reward we need for the work required.

Meanwhile, the youngsters discover for themselves that these things don't just "grow" on the grocery store counter. For the adults in the family, the exercise and subsequent relaxation provided by gardening are quite as beneficial as the added vitamins that an abundance of vegetables fresh from the garden can supply.

Nations and individuals continue to need home-grown foods. *There is still time to start a vegetable garden this year!*

WALTER ZULCH.

Mr. Zulch, an amateur gardener of Great Neck, Long Island, was to have spoken on this vegetable gardening topic on the New York Botanical Garden's radio program over WNYC *April 23. The program, with others announced in the spring series, was canceled because of the broadcasting of the United Nations proceedings. The paragraphs above are taken from the introduction to the script that was prepared.*

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THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

ROSE-GROWERS' DAY

at

THE NEW YORK BOTANICAL GARDEN

WEDNESDAY, JUNE 11, 1947

Arranged in co-operation with

THE AMERICAN ROSE SOCIETY

Second District (New York State)

MORNING PROGRAM

R. C. Allen, Executive Secretary, American Rose Society, Presiding

10:30 a.m. ***Inspection of the Rose Garden***
Under the leadership of L. C. Bobbink and his associates in the firm of Bobbink & Atkins

11:30 a.m. ***Roses in Landscaping*** — *Marian Cruger Coffin*, Landscape Architect

12:00 noon ***Report From Europe*** — *Robert Pyle*, President. Conard-Pyle Co.

12:30 p.m. ***Picnic Lunch***
(Each to bring his own. The Garden will serve a cold drink.)

AFTERNOON PROGRAM

Paul F. Frese, Editor of "Flower Grower", Presiding

2:00 p.m. ***Roses for the Collector*** — *Mrs. Richardson Wright*

2:30 p.m. ***New Pest Controls for the Rose Garden*** — *P. P. Pirone*, Associate Professor of Plant Pathology, Rutgers University

The program and lunch will be outdoors, in the vicinity of the Rose Garden. If rain occurs, the events will take place in the Museum Building.

As an aid in making arrangements for the outdoor seating, the New York Botanical Garden requests notification from those who plan to attend the program. There is no charge for registration.

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JOURNAL

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THE NEW YORK BOTANICAL GARDEN

VOL. 48 JUNE 1947 NO. 570

Let's Take the "Scare" out of Rose Culture

By Robert W. Eisenbrown

WHEN the request is made for fundamental advice on rose culture, the "experts" sometimes overlook the need for explaining the elementary principles to beginners. As a result, many gardeners feel there is some deep mystery connected with rose-growing and that far more skill and effort are needed to provide good roses than other flowers.

We have therefore asked Mr. Robert W. Eisenbrown of the firm of Bobbink & Atkins, to which the Botanical Garden is indebted for the majority of the 8,000 plants, more or less, in its Rose Garden, to give some simple directions, the ABCs, so to speak, on the culture of roses. Mr. Eisenbrown follows his six fundamental rules with some pertinent comments.

ROSE-GROWING is no more difficult than the culture of vegetables or perennials in the garden. It takes common sense and a little experience more than anything else. Carrying out the six simple suggestions offered here should give even a primary-grade gardener a promising start in the culture of roses.

(1) Select the healthiest-looking plants obtainable.

(2) Plant them in a deeply spaded soil with plenty of organic content.

(3) Firm the soil, layer by layer, about the roots, and don't be afraid of breaking a few roots by firm tamping.

(4) Avoid using quick-acting chemical fertilizer until the plants are well established; then top-dress the soil frequently but lightly.

(5) Remember that the use of all the new-fandangled insecticides in the world will not keep your roses healthy. You must have good plants to start with; then if they develop troubles you must apply the proper treatment for their specific ailments.

(6) Differentiate between the need for an insecticide to use against insects and a fungicide to keep away fungus diseases. Don't worry too much about the visible green aphids (though a Black Leaf 40 spray will keep them under control), but *do* worry about the invisible spores of fungus diseases, such as black spot, which *must* be prevented. (Dusting with micronized sulphur is still the favored control method used against fungus diseases by many professionals.)

Whenever I read directions on soil preparation and see the over-worked word "excavate," which implies extensive deep-down digging operations, I never want to see the word again. We are told to get a load of cinders, rubble, stone, etc., to fill in 9¾ inches, put a layer of 5⅝ inches of compost or manure over this, then fill in with good topsoil, whatever that may be.

This must be discouraging to the beginner, and many have found out in later years that it is not necessary. I have often stated that any good average garden soil that will grow a fair crop of vegetables or annuals or herbaceous perennials will grow good roses. I really feel sorry for the beginner who is led to believe that he has no judgment so far as soil preparation is concerned but must use a foot rule and have a thousand-pound scale handy in order to follow the many stereotyped rules.

Start With Husky-Looking Roses

I would like to emphasize the importance of getting strong, healthy, husky plants at the beginning. I know there are many who say that average or even inferior plants will do and that later they can be nourished and doctored by giving a lot of chemical and other patent feeding formulas, but this is decidedly not true. As a matter of fact, there is a tremendous amount of harm being done right now by overfeeding with chemical fertilizers. Scientists have proved that stunted growth and lack of bloom are often the result of overfeeding. Is this because of the gardener's anxiety to match those large exhibition blooms forced in a greenhouse, which one sees at the International Flower Show in New York?

A Feeding Problem

Perhaps a major point is often overlooked when feeding roses. It should be remembered that in most instances we are actually feeding the roots of a "wild" rose, such as *Rosa multiflora japonica* or "Gloire des Rosomanes" ("Ragged Robin"), for these two understocks are used for budding most of the "bush" roses in commerce today. True enough, some climbers and shrub roses are propagated from cuttings, and in the South "own-root" plants of hybrid teas still are grown. But when these tough "wild" understocks are used on roses, it seems to make sense, in the main, not to give them too much chemical fertilizer, especially in the beginning. For any kind of rose, there probably is still no substitute for decayed cattle manure incorporated with the soil *before* the roses are planted.

The word "everblooming," used so much in connection with roses, also makes the beginner expect and demand more from roses than from practically any other hardy herbaceous plant or shrub he may grow. Up to a few years ago, we were all pleased to have a month's display from our climbers and ramblers, but now a majority of gardeners cry for climbing roses all summer long—just as though such a thing were possible or even desirable. I am sure we would grow weary of looking at the same picture in the garden, were there to be a constant succession of bloom. The word

"everblooming" should not be taken literally, though it may be the best word that can be found today for the recurrent flowering of this class of roses.

If you are cutting roses for home decoration, leave a good portion of the stem on the plant. (All plants need leaves to function properly.) Cut some with long stems if you wish, but don't let anybody tell you the stems *must* be cut back to the "second set of leaves" or some such technical practice; the point will differ with each variety and the length and diameter of the individual stem.

Confidence Comes With Experience

Gardeners usually have good common sense and judgment and lack only confidence—which of course is a product of experience. They will make a few mistakes in the beginning but can always profit by them.

Practically all nurserymen and others who sell roses send a set of instructions along with an order, and these should be read carefully. I have never failed to learn something, either right or wrong, from these cultural instructions.

Volumes have been written on pruning, but in actual practice you will have to learn pruning by trial and error. Watch the results of high pruning, low pruning, pruning from the inside out, and all these little points that naturally come up with the pruning subject. Observe the difference between the treatment of climbers and ramblers; the pruning of shrub and old-fashioned roses . . . all these matters can hardly be explained in a brief article or even a text book. Notice that there is generally too much pruning on good live healthy plants where the canes are plump and fat.

At the same time, remember that rose plants seldom, if ever, die from too severe pruning; some may die from lack of sufficient pruning, especially newly planted ones; some established ones will not bloom for a year or two because of too severe pruning. But heavy pruning will not kill your rose.

Perhaps we should let our hybrid teas grows a little taller; it is silly to read, as we sometimes do, that they *all* are to be cut back to the second or third eye, or that they should be left no more than 6½ or 8⅝ inches above the ground level. We simply can not generalize on pruning methods because of the wide difference in habit and growth of the hundreds or thousands of varieties in commerce now. So I say, *experiment a bit.*

Take your rose growing as an adventure and I am sure you will get a lot more fun and pleasure out of it than were you to follow many technical formulas. Seek the best advice from those who have had the longest experience.

Micronesian Mangroves

By F. R. Fosberg

A Journey by Motorized Sampan to a Peak Development Of Land-Building Swamps In the Carolines

THE mangrove swamp is one of the world's most distinctive plant formations. It is found throughout the tropics on salt- or brackish-water mud-flats. Varying from place to place and hemisphere to hemisphere, its constant and outstanding feature is the presence of trees of the Mangrove family (Rhizophoraceae). The term "mangrove" is applied to many trees of various families that inhabit such swamps, but the true mangroves are *Rhizophora, Bruguiera,* and *Ceriops*—trees that have aptly been described as living in salt water, bearing their young alive, marching out to sea, and taking long ocean voyages.

Micronesia is an excellent place to become acquainted with mangrove swamps.

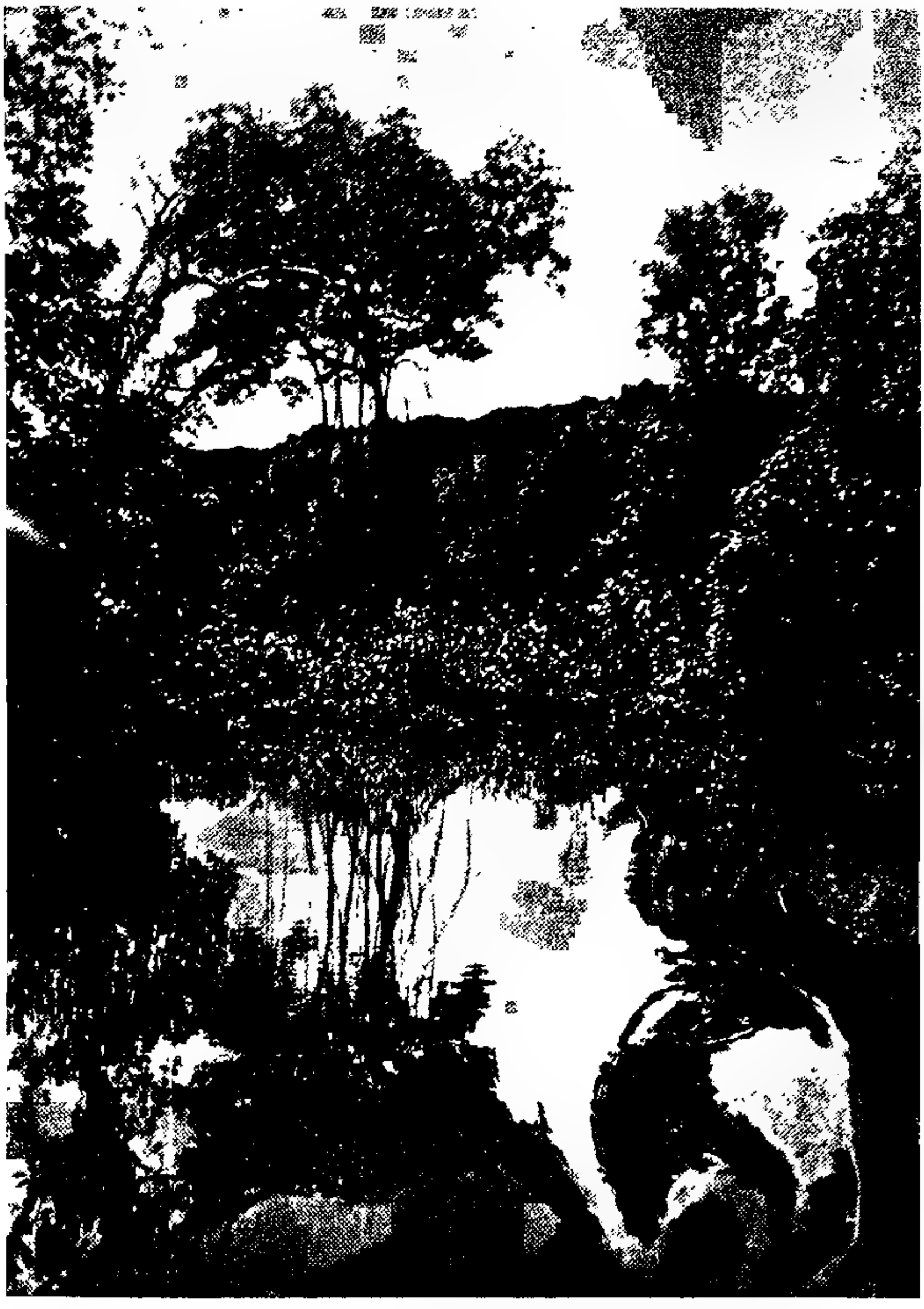
The Palau Islands form the extreme western end of the great Caroline Archipelago in the western Pacific. They are a compact group, mostly included within an enormous barrier reef. The largest island is Babeldaob, an elongate mass of ancient rocks and soils of volcanic origin, extending about 30 miles in the northern part of the group. Its western coast is precipitous and densely wooded. About half-way up this coast is a deep bay into which flows the Garamiscan River, a fair-sized stream that is navigable to small boats up to its first fork, at the head of tidal influence.

We had reports from members of our expedition* who had visited it earlier that this river meanders for many miles through a great mangrove swamp and jungle, with a fascinating diversity of trees and associated plants. Obviously here was a botanical opportunity which could scarcely be neglected, in spite of the shortness of our visit to Palau.

On inquiry about a native boat with a boatman who knew the river, I was assured that Olopsis was the obvious man. Consequently it was arranged that Olopsis should take me in his tiny sampan-style boat—an inheritance from Japanese days.

When the time came, the boat was awaiting me at the pier with its owner, a friendly, comical-looking but serious and helpful little Palauan, and his one-man crew. The boat was about fifteen feet long, with a tiny diesel motor which was started by heating its one cylinder with a gasoline blowtorch. The boat gave an impression of great instability because of its propensity to roll violently on the slightest provocation, but it always

* The U. S. Commercial Company Economic Survey of Micronesia, 1946.



Aerial roots of a rhizophora tree are reflected in the calm waters of the Garamiscan River.

righted itself just short of catastrophe. Its speed was ideal, since it was so slow as to give ample opportunity for study of any vegetation that we passed.

Along the west coast of the island the reefs kept us well out from shore, but near enough so that the forest looked very intriguing. The steep high slopes are densely covered with what appears to be the original, primary

forest of the region, perhaps the only sizable area of it left. In only a few isolated places between Aimeliik, at the south end, and Ngatpang Bay, which we were soon to enter, has it been visibly disturbed by human intrusion. Along the shore in the slight indentations and mouths of small streams appear narrow fringes of mangrove forest—almost exclusively made up of one species, *Sonneratia cascolaris*, a leathery-leafed tree of a different family from the true mangroves, but still characteristic of some of the mangrove areas. Related to *Barringtonia* and to the Myrtaceae, it is in a family of its own. Its predominance in localities exposed to pure salt water suggests that, of all the mangroves, it will tolerate the most salt.

Finally, between two peaks, we reached an opening, partially obscured by small islands. Entering, we found ourselves in a sizable enclosed bay. Called Ngatpang by the natives, the name has been variously corrupted by Europeans and Japanese to Natpang, Gaspan, or Gasupan. The bay is lined with mangrove swamp except for a few places on the north shore where the hills come down to the water's edge. One of these, with a single small hut, called on the map Kamset or Kamesetsu, we recognized as a locality appearing on specimens collected in Palau by the Japanese.

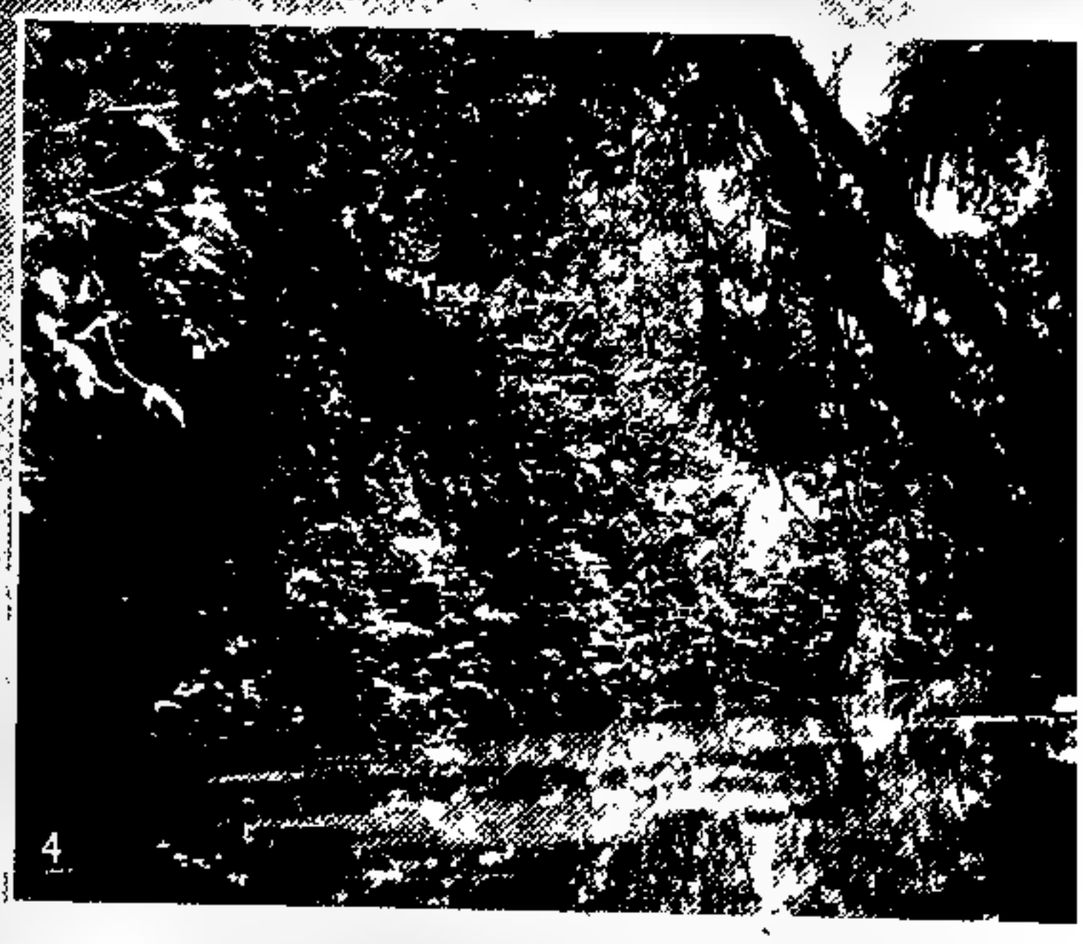
The mangrove swamps surrounding the bay are, at the bayward edge, dominantly of *Sonneratia cascolaris.*

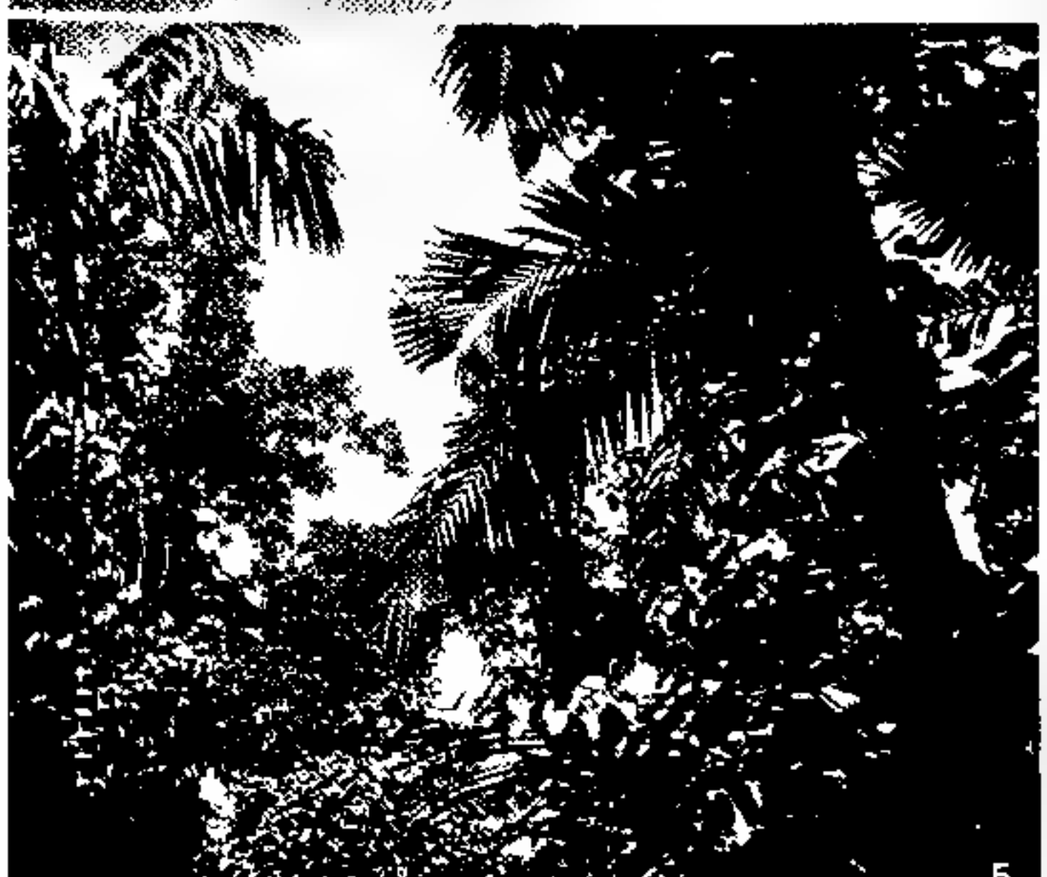
Soon we entered the northern arm of the bay, really the mouth of the Garamiscan River. Almost immediately *Rhizophora,* probably *R. mucronata,* takes over the dominant role in the vegetation. This odd tree may be taken as characteristic of the family of the true mangroves. It has opposite leathery elliptic leaves, but its most striking character is the abundance of arching prop-roots holding up the trunk, and aerial roots even reaching down from the branches to the mud in which the tree grows. Another notable characteristic, peculiar to certain genera of this family, is the habit of germinating its seeds while still in the fruit, hanging on the

MANGROVE SWAMPS OF BABELDAOB IN THE PALAU ISLANDS
(On the opposite page)

1. *Fronds of a nephrolepis hang in a tremendous clump from the branches of a tree along the lower part of the Garamiscan river.* 2. *Navigation ends at this point on the Garamiscan.* 3. *It might be New England or the Middle West, but is really Babeldaob, at a point where a meander of the Garamiscan River, lined with mangrove swamps, reaches the base of the hills along the north side of the valley.* 4 *In this riparian forest on the upper Garamiscan, trees are tangled with lianas, mostly species of Freycinetia.* 5. *Not far below the head of navigation, palms are among the conspicuous plants in the swampy forest.* 6. *The aerial roots of rhizophora half screen a clump of nipa palms on the swampy shore of the Garamiscan river.*

ON THE GARAMISCAN RIVER





MANGROVE SWAMPS OF BABELDAOB IN THE PALAU ISLANDS

(For description of the pictures, see the opposite page)

tree. A large seedling is produced, mostly made up of a cigar- or torpedo-shaped root or radicle up to eight inches or a foot long. This hangs by its two tiny cotyledon leaves which still stick into the body of the fruit. When the time comes, this odd little plant lets go its hold and drops into the mud below, point down. Here it immediately takes root, and the successive crops of these seedlings fringing the outer edges of the swamp may be likened to armies of plant-soldiers headed on their stilt-legs out to sea.

If the tide happens to be high the mud is covered and the seedling, instead of rooting in the mud, may be carried away by the water. Very resistant to salt, it floats around until it is cast up on a beach to dry, or more fortunately, on another mud-flat, where it takes root, possibly starting a new mangrove swamp. This habit seems unique to the salt-water members of the Rhizophoraceae. It obviously makes possible the wide distribution of the true mangroves and accounts for their presence in practically all mangrove swamps.

As the estuary grows narrower and assumes more of the character of a river, the other members of the mangrove assemblage of plants make an appearance, mingled with the one or two species of *Rhizophora.* Noticeable are *Bruguiera,* another genus of true mangroves with a red and a yellow flowered species; *Lumnitzera littorea,* a fleshy-leafed tree of the Combretaceae with abundant small scarlet flowers; and *Xylocarpus granatum,* a member of the Anacardiaceae, or Cashew family, with inconspicuous racemes of tiny white flowers, but with huge pendent fruits like small cannon-balls on strings. Here the river is still wide enough so that abundant sunlight bathes the trees on its banks.

As the river narrows and the banks are shaded by tall trees, the composition of the swamp forest changes. *Bruguiera* gradually replaces *Rhizophora* as the dominant tree. Openings along the banks where sunlight penetrates are marked by clumps of the nipa palm, *Nipa fruticans.* This palm is characteristic of estuaries throughout the Indo-Malayan region and into the Pacific through most of Micronesia. It has a short subterranean stem, buried in the mud of the swamp, and the huge frond-like leaves ascend as much as twenty feet. The hard fruits are borne in heads on erect peduncles among the leaf-bases. The leaves are widely used for thatching and from the sap toddy is made in many parts of the East.

The great marsh fern, *Acrostichum aurcum,* also inhabits openings. It has quite a range of tolerance of varying degrees of salinity, and in places is dominant in open saline marshes.

Along this lower river course the distribution of epiphytes is very peculiar. Except where the ubiquitous leathery-leafed fern, *Davallia solida,* crawls with its thick rhizomes here and there throughout the forest,

Low tide on the Garamiscan River, Palau, reveals the rhizome of the palm, Nipa fruticans, exposed by the washing away of the mud. A seedling of a rhizophora can be seen at the right.

trees bearing epiphytes are few and widely scattered. However, when epiphytes do occur on a tree, there are many of them. *Nephrolepis* fronds as much as three or four meters long hang in great masses from the tree trunks. Other ferns and occasional orchids are also found. As we penetrate deeper into this swamp, trees with epiphytes become more and more common until they are abundant along the inner edges of the mangrove swamp proper.

Here several lianas may also be found, such as *Freycinetia,* the climbing member of the Pandanaceae; *Schefflera* of the Araliaceae; *Derris trifoliata,* a legume with its rare pink flowers likely to be borne anywhere along the elongate cord-like stems, and a *Hoya* or other asclepiad that hangs vertically from the trees.

By now the trees are actually meeting overhead. *Barringtonia racemosa, Samadera indica, Heritiera littoralis,* and *Pterocarpus carolinensis* become important in the vegetation, and some of the mangrove species begin to drop out. Masses of the holly-leafed *Acanthus ebracteatus* (*A. ilicifolius*), an amphibious tangled bushy liana, are seen along the banks between tide levels.

One of the striking features of the river banks and floor of the swamp is the great variety of pneumatophores, or aerating organs, found at the bases of the trees. Every species of tree common in the mangrove formation

has a characteristic structure apparently for this purpose. The *Rhizophora* species have numerous aerial roots entering the mud. The *Bruguiera* species have true knees, sharp upright bends in the horizontal roots, protruding above the surface with corky aerogenous tissue building up the top. *Sonneratia* has abundant erect conical spire-like organs resembling inverted carrots, while *Lumnitzera* has similar but much smaller and more slender ones resembling inverted roots. *Samadera* has extensive intricately curving buttresses, the upper edges corky, above the surface of the mud. These organs are so characteristic and varied that it would be easy to construct a key to the species of trees in the mangrove formation on the basis of pneumatophores alone.

Toward the head of tidal influence the river becomes mainly a tunnel winding through a dense tall riparian or swamp forest which has few mangrove genera left. Many others have appeared—*Vitex, Cynometra, Columbia, Semecarpus* with poisonous blackening sap reputed to rot away the flesh it touches, and some whose identity is not obvious—of a more mesophytic character, reflecting, perhaps, a complete disappearance of salinity. Though still subject to tidal fluctuation, the water this far up the river seems perfectly fresh.

Here the forest takes on much the character of the tropical jungles pictured in old illustrated books and modern Sunday supplements. A dense

In a mangrove swamp north of Lele on Kusaie, the pneumatophores of Sonneratia caseolaris look like closely-packed stalagmites rising from the roots below the water.

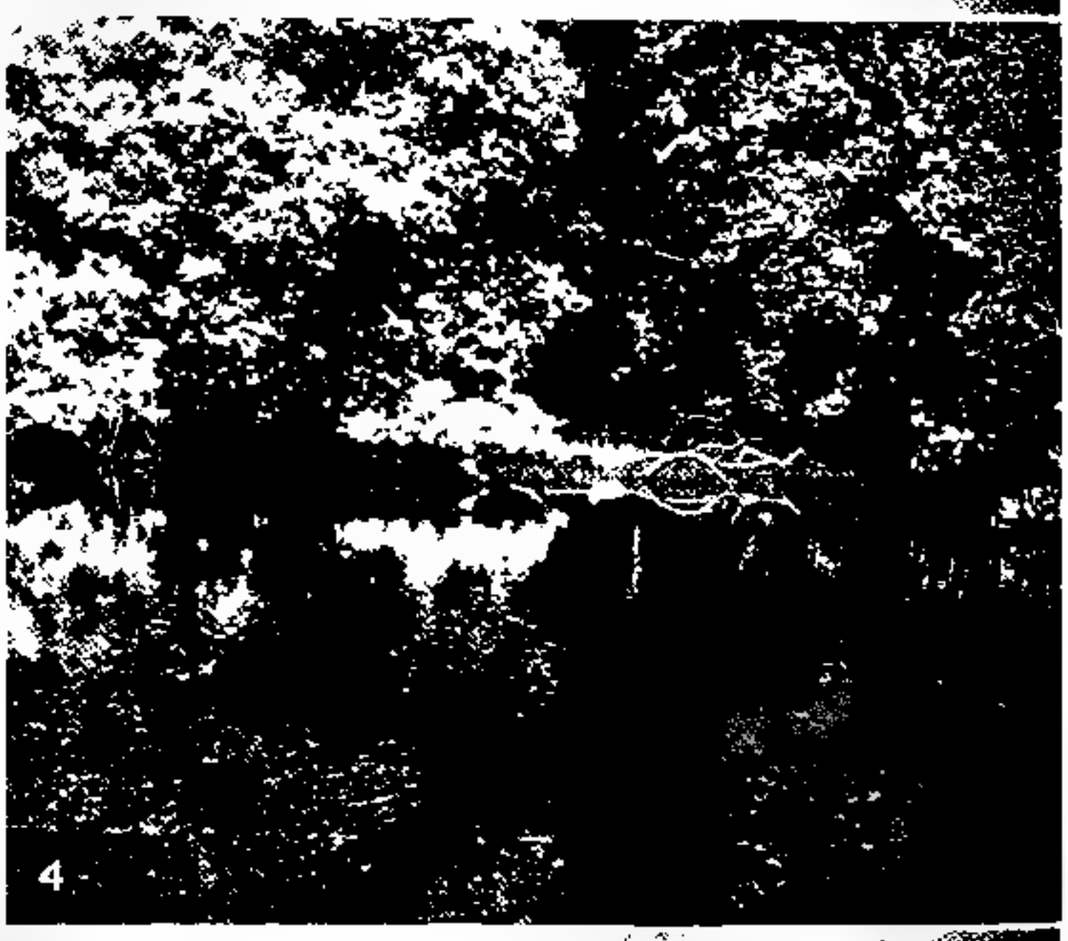
A formation resembling a mangrove swamp occurs in a marsh of nearly fresh water around Lake Susupe, Saipan. Plants shown here include the fern, Acrostichum aureum; the fragrant white-flowered shrub, Clerodendrum inerme; the yellow-flowered woody plant, Hibiscus tiliaceus; and the grass, Paspalum vaginatum.

canopy spreads overhead. Lianas hang from this canopy. Aroids and species of *Freycinetia, Schefflera,* and *Derris* festoon the tree trunks. There are palms in the forest and large-leafed members of the Maranta family in small openings. Epiphytic ferns, *Psilotum* and other lycopods, as well as orchids abound on the tree trunks cushioned by mosses and leafy hepatics.

At the head of navigation and tidal influence one bursts forth from the jungle into open country formerly cultivated by the Japanese. Here are even the ruins of a bombed out pineapple cannery and old pineapple fields. The pineapple plants, which are apparently of two very superior varieties, are still bearing fruits, though, as often happens with abandoned pineapple fields, the fruits have become very small.

In this river the Japanese hid their small craft during the war. That the concealment was futile is obvious. Now it is necessary to pick one's way among sunken landing craft, small cargo boats, and other shallow draft wreckage left by the efficient American bombers.

Monkeys and crocodiles were said to abound along this river before the war. The monkeys are not now in evidence. They were eaten by the Japanese, say the natives. And we saw only one crocodile slip off a mud-bank into the still water. The war has affected not only the human population of these islands.



MANGROVE SWAMPS ON THE ISLAND OF KUSAIE

1. The head of Lele Harbor, with Mt. Crozer in the background, is lined with mangrove swamps. 2. Epiphytic ferns, a species of Nephrolepis, hang in long strands from a Sonneratia tree in a mangrove swamp north of Lele. 3 and 4. Sonneratia caseolaris is a dominant tree in the mangrove swamps of this region. The pneumatophores show clearly in the picture at the left. The wood of Sonneratia is sometimes used for timber on Kusaie. 5. Nipa fruticans is seen frequently here, as in other mangrove associations of Micronesia.

Palau is where the mangrove flora is at its best in Micronesia. From here northward and eastward it becomes more and more attenuated. To the north this takes place rapidly. In Guam only five or six of the species characteristic of this formation are found, and in Saipan only three. *Acrostichum aureum* reaches the limits of the formation to the north, and *Bruguiera conjugata* and *Clerodendrum inerme* to the east and north.

Eastward through the Carolines in the high volcanic islands the mangrove swamps are well developed, though there is a marked dropping out of species toward the eastern end of the archipelago. On the low islands there are small colonies, mainly *Bruguiera*, where there are traces of suitable habitats.

Mangrove Swamps of Other Islands

On Kusaie, the easternmost of the Carolines, we were afforded another remarkable opportunity to study a large mangrove swamp at close range. To get from Lele, on the east side of the island, to the north coast we had to traverse a large swamp by outrigger canoe, paddling and poling through a winding channel for several miles. Along this channel the quiet black water reflecting the magnificent trees, the clumps of *Nipa* here and there, and scattered trees covered with epiphytes, form a scene whose beauty is hard to portray effectively. The flora here is very simple compared with that of the Palau swamps. The trees are principally *Sonneratia, Bruguiera conjugata,* two species of *Rhizophora,* with a few secondary ones. Far fewer species of ferns and orchids, as well as lianas, are noticed here, though individuals are numerous enough.

A detailed floristic comparison of the mangrove flora of the high islands and groups in the Carolines—Palau, Yap, Truk, and Kusaie—would be very instructive, but the information is not yet available.

To our great surprise, we found that the mangrove formation extends to the Marshall Islands—all low coral islands which do not usually provide the sort of habitat occupied by this type of vegetation. The one mangrove swamp that I saw in the Marshalls is on Ailinglapalap Atoll and is dominated by *Rhizophora* and *Sonneratia*, accompanied by little else. The bottom is of fine calcareous silt, and there is an outlet to the lagoon.

Sonneratia occurs rarely on Jaluit Atoll also, but here on a flat of bare coral rock exposed by medium and low tide, in the pure salt water of the lagoon. Its ability to tolerate high salt concentrations is well established by this occurrence, where evaporation during exposure at low tide would concentrate the salt even more than in normal sea water.

Most of the mangrove vegetation in the Marshalls is in a different habitat entirely. In depressions of clear brackish or semi-salty water, usually rock-bottomed, are found stands of *Bruguiera conjugata* or occasionally *Lumnitzera littorea.* I did not see these mixed in the same de-

In the shallow water of a lagoon on Udot Island, Truk, rhizophora trees are growing in island-like formation.

pression. Two species here enter the mangrove formation that elsewhere occupy other habitats—*Pemphis acidula* and *Intsia bijuga.* The former is characteristic of coral rock at or just above sea level and within the immediate influence of the sea, while the latter is an inhabitant of elevated limestone, further west and south in the Pacific. *Clerodendrum inerme* occurs usually as a secondary shrub in the edges and openings, and *Nephrolepis* occasionally grows as an epiphyte.

Though there is no question that these occurrences are a part of the mangrove formation, they are scarcely swamps, as they are rock-bottomed. I have called them "mangrove depressions." The flora of the formation here at its eastern limit is a poor one indeed. The ultimate in reduction comes in the small depression on dry Bikini where William Randolph Taylor found one individual of *Bruguiera conjugata.*

In Micronesia the mangrove swamps have, at present, little economic importance, except that some of the trees are occasionally used for timber, as is *Sonneratia* on Kusaie. However, in other parts of the world *Rhizophora* bark is an important tan-bark. In the Philippines mangroves yield timber, tan-bark, firewood, and charcoal, while nipa palm leaves are used for thatch and nipa sap for toddy, alcohol, and sugar. In all regions, too, the mangroves are builders of new land. The mud caught among the dense tangles of roots settles and after a while a deposit is accumulated that reaches the surface of the water. Rains leach out the salt, and eventually rich habitable land results.

Usually the mangrove belt is passed by as dreary, uninteresting, and mosquito-infested by the tropical traveler, but to the botanically inclined, or even to the seeker of beauty, this region well repays closer acquaintance.

EARLY JUNE IN THE GARDEN

By ARTHUR W. KING

AT this season of the year, from the end of May through early June, garden work is usually one or two jumps ahead of the average gardener, whether he be an old professional or the newest amateur. The only way to clear up the backlog of work is to keep right at the job. Eventually we begin to see that something is really being accomplished.

The End of Spring

By now our early spring displays in the garden have already come and gone. Although the flowers have disappeared for the season, nature demands that these plants should be allowed to retain their foliage to a great extent, to enable them to build up resources for flowering next year. To mention a few:

Narcissi are finished and their foliage tends to give the border an untidy appearance with their straggly leaves in unsightly disorder. Some people think this can be corrected by simply cutting them off near the ground, but this method is wrong; they should remain till they start to yellow with age before being cut down. The untidy appearance can be remedied by gathering a few leaves together and either tying them in a loose bunch, or slipping a thin rubber band over them - but not so tightly as to cut the foliage.

Tulips should have the flower stem removed, but two or three full leaves left to furnish next season's bulb with material for growth.

Bleeding-heart should be allowed to have its own spot in the border till late summer, for if it is smothered by late growing annuals or perennials, it will surely die.

If your iris clump is too large, cut the leaves away to the desired size immediately after flowering. Put the roots in a corner of the garden for replanting later. This season's show of bloom is finished for all these plants, and the space can better be used for annuals during the summer.

Transplanting Annuals

Although by the end of May nearly all annuals can be safely planted, if it is a wet, cold season there is very little gained by transplanting some of the tender annuals under such conditions. It is better for the plants to wait for more favorable weather in early June than to run the risk of getting them badly chilled and stunted after growing them along under cover for weeks.

When we say "tender annuals" we mean such plants as fibrous begonias, browallias, annual vincas, zinnias, impatiens, torenias, etc., all of which are native in warmer climates than ours. The usual run of these annuals will stand planting out any time after all danger of local frosts is over, the earlier the better (although early June will do), to give them a chance to get well established before they are burned by the hot midsummer sun. It is often a very short step between the frosts of spring and the heat of summer.

Also ready to be set out in early June are geraniums, heliotropes, lantanas, fuchsias, and such plants grown in pots for outdoor planting.

Perennials for Autumn

Some of the late summer and fall flowering hardy perennials can be transplanted at this season. These would include the fall flowering asters, chrysanthemums, boltonias, rudbeckias, or coneflowers, heleniums, or sneezeweeds, and eupatoriums of various kinds. If any of these late blooming perennials—most of which are native American plants—are transplanted now, be very careful to get a good ball of soil with the roots when moving them; otherwise the severe check will be too much for them, and they will make poor growth and give few flowers for this season.

Staking at the Start

If you already have plants in your border that need staking, such as delphinium, peonies, foxgloves, or Canterbury bells, or if you are setting out dahlias or other tall subjects, common sense should tell you to do your staking at the start. And be sure that the stake is tall enough and strong enough to serve its purpose through the season. You can't stake plants successfully at the back of the border after you have set out young plants or sown seeds at the front. You also avoid root injury, particularly with dahlias (and in the vegetable garden with tomatoes) if the stakes go into the ground right along with the plants. Another point to remember is to put in your stake on the side of the plant farthest from the front of the border, or if possible near the center of the plant. Stakes are never a thing of beauty in a flower border, so try to hide them as much as possible.

Technique of Transplanting

When you are ready to plant, make sure the location in the border will suit your young plants when they are fully grown. If you are in doubt as to the height or character of any plants you have, look in a good seed catalogue, or a reference work like Bailey's Cyclopedia; or, if you purchase the plants, ask the nurseryman or salesman. Then jot down the height in inches on the label; it will be a great help in placing your plants in the border.

After you have determined the location for several of your plants, set them in the ground at once. Place and plant about ten or so at a time. Keep the balance in the shade until you are ready for them. Early morning or evening is the best time of day for planting, for the sun will then not burn the roots before you get them into the cool, moist soil.

When planting, be sure you make the hole large enough. If the roots are loose, hold the plant up by the sides to see how far the roots hang down, then allow the same depth of hole for planting. If the plant has been pot-grown, allow the top of the ball of soil from the pot to be about one-half inch lower than the surface of the soil in the border. When firming the soil around the plant, do not press hard against the plant itself; it is much better to note the width of the ball of soil that was on the plant, then press gently but firmly in a circle about the same size around the plant. If you want to be sure of a firm planting, the handle of the trowel can be used as a ramming tool, but do the ramming evenly. Be very careful not to break the ball of soil away from the plant. Try to leave it the same as it was in the pot.

Whether the day is rainy or dry, be very sure to water every plant immediately after planting. The safest way is to make a saucer-like depression around the plant, and fill this with water whenever the soil is dry during the first two weeks. This is the hardest time for newly planted material, and close attention to watering will often mean the difference between success and failure for the entire season.

Try to do all planting at a time when the soil is a bit on the dry side; it is more easily handled then and packing of the soil in the border is avoided. After planting, the question of sufficient moisture can be taken care of by the garden hose or watering-pot.

Vegetable Transplants

In the vegetable garden it is time to get the tomatoes, peppers, and eggplants set outdoors; also the melons and cucumbers that have been started in pots in a frame. Starting them early is a great time-saver, and means ripe fruit weeks in advance of an outdoor sowing.

Melons and cucumbers will do better on a raised mound of soil, about as much as one wheelbarrow of good rich soil.

Peppers and eggplants can be set in rows about 24 inches apart, with a distance of about 20 inches in the rows.

If the tomatoes are strong, sturdy plants, they may be planted at normal level; but if they are drawn and thin in growth, it may help to plant them a few inches below the usual planting depth.

If you are growing celery, your young plants can be set in the garden now, but be sure to keep them thoroughly watered until they start growing again.

Vegetable Seeds

Lima beans, both pole and bush types, can be planted now. Succession sowings of string beans and lettuce can be made till early August, and for continuous crops, seeds of sweet corn can be put in till the middle of July. These sowings should be timed about 12 to 14 days apart for best results.

Fund of Quarter Million Provided For Antiviral Research

THE March of Dimes campaign for research in infantile paralysis has brought a new, special fund to the New York Botanical Garden, according to an announcement released by the National Foundation for Infantile Paralysis April 14. The program for research, announced jointly by Basil O'Connor, President of the Foundation, and Joseph R. Swan, President of the Garden, will be financed with $225,000 over a five-year period. The work will be done in a newly equipped laboratory under the supervision of Dr. William J. Robbins. The announcement says, in part and in substance:

> For the past several years the Garden's scientists have been studying antibiotic substances capable of inactivating bacteria. They have grown more than 1,000 organisms, mainly fungi, many of which have shown evidence of being able to inactivate bacteria.
>
> Dr. Robbins, also professor of botany at Columbia University, proposes to test these and other organisms for their effect on bacterial viruses, scientifically known as bacteriophage.
>
> According to Dr. Robbins, the relationship between bacteriophage and viruses is sufficiently close to warrant this method of approach. Any of the new substances which may reveal a destructive effect on bacteriophage will then be given to others for test against animal viruses, including the one responsible for infantile paralysis.
>
> The discovery of penicillin, said Dr. Robbins, has led to extensive investigation of other antibiotic substances effective against bacteria but little has been done in the search for substances active against viruses. The new study, he said, will try to answer the question: Are there antibiotics which can check the growth of viruses?
>
> "It is probable," he added, "that the most practical approach to the control of poliomyelitis would be through immunization, if a suitable weak strain of the virus could be developed and maintained, or if a method of partially inactivating the virus could be discovered.
>
> "It is conceivable that partial inactivation or weakening might be accomplished through a suitable substance which might have such an effect on viruses. This we do not know."
>
> In amplifying the Botanical Garden's choice of using bacteriophage or bacterial virus in its preliminary screening experimentations, Dr. Robbins said 100 or more substances could be investigated for antiviral activity against bacteriophage in the time required to determine the action of one such substance on an animal virus.

Volunteer Associates Organized For Garden's Development

MRS. JAMES C. BRADY and Mrs. Donald Straus have been named as co-chairmen to head a new group of workers, organized by the Garden's Manhattan office and called the New York Botanical Garden Volunteer Associates. The object is to assist in the Garden's development and fund-raising program, also to incorporate all volunteer activities under one central committee.

When President Joseph R. Swan announced the formation of this new group, he said that in the campaign for $5,000,000

being sought for scientific research and exploration and for expansion of the Garden's horticultural and educational activities, one and a quarter million dollars had already been received in donations, bequests, and memberships.

Mrs. Francis K. Kernan is vice-chairman of the Volunteer Associates, and there is an advisory board including Mrs. Allmon Fordyce, Mrs. Melvin E. Sawin, Mrs. Oswald B. Lord, and Mrs. Philip Weld. Chairmen of sub-committees include Mrs. Charles Burlingham, displays; Mrs. Straus and Mrs. Lord, education; Mrs. John D. Beals, Jr., and Mrs. Sawin, lectures; Mrs. George K. Livermore, memberships; Mrs. Henry S. Fenimore Cooper and Mrs. Harold R. Mixsell (vice-chairman), special events; Mrs. Gardner D. Stout, veterans; and Mrs. John D. W. Churchill, schools.

Du Pont Gardens Visited Under Botanical Garden's Auspices

MORE than 400 men and women made a special trip to the gardens of Henry F. du Pont, "Winterthur," near Wilmington, and of Pierre S. du Pont, "Longwood," Kennett Square, near Philadelphia, May 1 under the auspices of the New York Botanical Garden. The visitors included members of the Garden and of Federated Garden Clubs of New York, New Jersey, and Connecticut. At Winterthur, where spring was ten days or more ahead of New York, they enjoyed the flowering quinces of pink, yellow, and apricot, with the orange-red ones, massed against dark evergreens and flanked by the white of *Spiraea arguta*. The yellow flowers of *Rhododendron Keiskei* drew attention, as did the wild flowers such as *Trillium grandiflorum*, *Dentaria laciniata* (toothwort), and *Uvularia grandiflora* (bellwort). Notable also among the native plants were great masses of Virginia bluebells (*Mertensia virginica*), some of them grouped with naturalized narcissi in pale yellow and white. Azaleas were just beginning to show color.

At Longwood, the features were the vast indoor gardens in the conservatories, the arboretum, and the series of decorative fountains outdoors, modeled after those at the Villa Gamberaia in Florence, Italy. In the conservatories azaleas were in full bloom, also tulips, fuchsias, delphiniums, and roses, besides many amaryllises and orchids, and large beds of annuals. The arboretum at Longwood consists of many exotic specimens of evergreens and other trees, some of which were planted there in 1800.

Tropical Fruits and Flowers In Summer Exhibit At the Garden

LIFE-SIZE watercolors of tropical flowers and fruits by Lee Adams of Mandarin, Florida, will be on view at the New York Botanical Garden during June and July. Among the twenty paintings which he has sent to the Garden are portraits of the breadfruit, ceriman, cola, mango, mangosteen, and rose-apple.

Mr. Adams began his work under Dr. David Fairchild of Coconut Grove, Florida, for whom he made a pictorial study of the mango. Then under the auspices of Dr. Fairchild, Dr. George H.

"Grapes and Doves," one of the paintings by Lee Adams on view at the New York Botanical Garden during the summer.

Opdyke, and Dr. Wilson Popenoe, he spent some time in Guatemala and Honduras, where he studied and painted tropical fruits and flowers in their natural setting, often with native birds among the branches.

Last autumn, as a member of the Opdyke party, he traveled to Yucatan to make studies of the cherimoya, returning to his studio in Mandarin early this year. Before starting to devote himself to his art, he was a student assistant in botany at Rollins College in Florida and at the University of North Carolina.

Notes, News, and Comment

A. J. Grout. The Garden's Honorary Curator of Mosses, Dr. A. J. Grout, died March 27 at East Bradenton, Florida, after a three days' illness with pneumonia. An appreciation of his life and work, prepared by Mrs. Inez M. Haring, will appear in a forthcoming number of the Journal.

Exhibit. Flower pictures by Tabea Hofmann, which were on display at the New York Botanical Garden during May, included originals from eight of the ten gardening books which she has illustrated during the past four years, in addition to the "Illustrated Encyclopedia of Wild Flowers" by Ethel Hinckley Hausman, published this spring by Doubleday. Besides native wild flowers, the collection includes waterlilies, orchids, fuchsias, African violets, pelargoniums, vines, begonia leaves and flowers, and South American plants.

Many of the subjects were drawn from life in the Garden's outdoór plantings and greenhouses. While some of Miss Hofmann's work is in watercolor, most of it is done with conti crayon.

Groups. A special tour of the Garden was arranged for a group of 150 New York City students May 11 by the Education Committee of the Garden's Volunteer Associates in co-operation with the Adult Students' Council of the Adult Elementary Students of the Board of Education. "The Gift of Green" was shown and the students were guided on tours of the rock garden and conservatories.

The Garden Circle of New Rochelle toured the Rock Garden and saw the Garden's film "Plants and the Life of Man" May 6.

The students of P. S. 4, 1701 Fulton Avenue, in the Bronx visited the Rock Garden and Main Conservatory May 9.

Dr. F. J. Seaver guided a group of members of the Staten Island Institute of Arts and Sciences around the grounds May 10.

Lectures. On the evening of May 24, at Mt. Holyoke College, Dr. W. H. Camp addressed the Four-College Genetics Conference—composed of the biological faculties of Amherst College, University of Massachusetts, Mt. Holyoke College, and Smith College—on "Distribution Patterns in Modern Plants and the Problems of Ancient Dispersals."

Dr. William J. Robbins and Dr. B. O. Dodge attended the National Academy of Sciences meeting in Washington, D. C., from April 27 to April 30.

Dr. Robbins also spoke at the 47th general meeting of the Society of American Bacteriologists at Philadelphia. May 13 he talked on *Trichophyton* in a round-table discussion of "Mold Metabolism;" two days later he discussed "Nutrition of the Filamentous Fungi" in a round-table on "Growth Factors for Pathogens."

The Garden Club of Mamaroneck, an affiliate of the New York Botanical Garden, heard Dr. A. B. Stout speak on the subject of "Daylilies: Old and New" on April 28.

Dr E. E. Naylor spoke before the National Life Conservation Society in the Roosevelt Hall of the Museum of Natural History on the New York Botanical Garden. The film "Plants and the Life of Man" accompanied the talk.

Dr. and Mrs. F. J. Seaver substituted for Dr. and Mrs. William J. Robbins as representatives of the Garden at a communion service and breakfast given by the St. George's Association of the Department of Parks at Riverside Church April 27.

Approximately 85 people attended the program given by the Lecture Committee of the Garden's Manhattan office May 5. Events included guided tours of special features, consultation with staff members, and a buffet luncheon.

Visitors. Dr. Werner Hügin of Basle, Switzerland, who has come to America to study the use of curare, visited the Garden's herbarium last month to see specimens of plants from which the insecticide is derived. He will be the first one to use curare in Switzerland. Dr. Hügin stopped at the Garden on his way to Harvard, where he will study for a year.

Professor Francis Ryan of the Department of Zoology and Genetics at Columbia University, with a group of graduate students, visited the Garden's laboratories May 9. They were interested in the pink bread mold *Neurospora*. Work on this fungus has been carried on in the laboratories for many years.

Enroute to London to join the United Nations conference on forestry, Christopher Swabey, Conservator of Forests in British Guiana, visited the Garden April 30.

E. J. H. Corners, Assistant Director of the Singapore Botanical Garden stopped at the Garden on his way to the State of Pará in Brazil where he will resume his duties as principal Field Scientific Officer in Latin America for UNESCO.

Dr. Karol Maramorosch, arriving recently from Rumania, visited Dr. B. O. Dodge in April. He plans to make his home in the United States and hopes to be able to continue work in plant pathology for a higher degree. He has been working for three years in the laboratory of Professor and Mrs. Trian Savelescu at the University of Bucharest. Mrs. Savelescu was formerly Alice Aronescu, who worked for her doctor's degree investigating black spot of roses at the New York Botanical Garden under Dr. Dodge.

Among the visitors at the Garden's display at the Flower Show was Dr. O. W. Barrett of New York City, who explored in Mexico with Cyrus Pringle in 1897. He was a friend of the Brittons, and passed considerable time with them in Puerto Rico in the early years of the century, and has done exploring of his own in practically every tropical country of the world. He is a frequent visitor to the Garden's conservatories, where he often finds plants that have been familiar to him in their native habitats.

Visitors who have spent some time in the Garden's herbarium include William

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C. Steere of the University of Michigan, studying the mosses; Richard Evans Schultes, Harvard University; H. M. Fitzpatrick and Richard P. Korf of Cornell; Caroline K. Allen from the Arnold Arboretum at Jamaica Plain, working in the Lauraceae; Clarence J. Hylander of the Macmillan Co., and Donald G. Huttleston, Cornell University.

Other recent visitors to the Garden have been Josiah L. Lowe of the College of Forestry, Syracuse, N. Y.; Richard Whindling, also Roger P. Wodehouse, Lederle Laboratories, Pearl River, N. Y.; M. A. Johnson of Rutgers University; and Dr. Clyde Chandler, on her way from Guatemala to Doylestown, Pa., where she is now doing work in plant breeding for the Burpee Co.

Advisory Council. Newly elected members of the Advisory Council are Mrs. John Sloane and Mrs. Thomas D. Thacher of New York City; Mrs. Montgomery Hare of "Sunningdale," St. James, Long Island, and New York City, and Mrs. Roy Arthur Hunt of Pittsburgh, Pa.

Staff Conference. The monthly conference of the scientific staff and registered students of the New York Botanical Garden was held on April 10. Dr. William J. Robbins and Dr. Ilda McVeigh spoke on "Relation of *Rhodotorula aurantiaca* to Folic Acid and Related Compounds," and with Dr. F. W. Kavanagh, Dr. Robbins spoke on "Antibiotic Activity of *Polyporus biformis.*"

Field Botany. A record number of students registered in the class in Field Botany opening April 19 under the direction of G. L. Wittrock. Among the more than 30 adults who came to learn about the wildflowers and other significant plants of spring are a practising physician, a priest, a nun, a scout leader, at least one mother of a family, and a group of laboratory workers.

Members' Days. In speaking on the topic "Nature's Gamble in Producing New Plant Forms" at the Members' Day program of March 5, Dr. A. B. Stout explained the significance of the term polyploidy and what it means to gardeners.

On April 2 Dr. Roger P. Wodehouse, author of "Pollen" and "Hayfever Plants" and a member of the New York Botanical Garden for many years, spoke on "Vacations without Hayfever," describing and showing slides of plants which are guilty of producing irritation to the respiratory organs and naming regions in the East, especially high-mountain areas and coastal dunes, which are fairly free from these plants.

At the program given May 7, Victor Greiff of Neponsit, Long Island, a member of the Garden, exhibited a number of plants he had grown, while he talked on "Adventures in a One-Man Greenhouse."

Flower Prints. To open an exhibition of flower prints that have been published from the tenth century down to the present day, which will continue at the Morgan Library until July 26, an address was given April 28 by Mrs. Allan Marquand on "Flowers of Ten Centuries." Mrs. Marquand, who has been closely associated for many years with the world of art and of horticulture, has been a member of the Garden since 1923. In 1940 she contributed two articles to the Garden's Journal entitled "Some Horti-

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cultural Portraits" and "Autumn in the Pine Barrens."

The earliest illustration shown in the Morgan Library's exhibition is a tenth century representation of a rose in a Byzantine manuscript of *De Materia Medica* of Dioscorides. The most recent is an illustration of the same flower in Willmott's *Genus Rosa,* published in 1914. The collection includes a group of illuminated manuscripts from the 14th to the 16th century, the earliest printed book dealing with plants and flowers (Pliny's *Historia naturalis,* Venice 1469) and the first illustrated printed book on flowers (the *Herbal* of Pseudo-Apuleius which appeared in Rome about 1483). A catalog published for the exhibition contains Mrs. Marquand's address and 12 full-page illustrations.

NOTICES AND REVIEWS OF RECENT BOOKS

The Quality Of Our Food— Where It Comes From And What It Does

THE SOIL AND HEALTH. Sir Albert Howard. 302 pages, illustrated, indexed. Devin-Adair Co., New York. 1947. $4.

This book presents a challenging discussion of the decadent health of crops, animals, and man as premised on the despoilation of the organic fertility of our soils.

With vehement voice Sir Albert Howard mentions our shortcomings in thinking about soils, agriculture, human nutrition and health. That we should indulge in laboratory analysis of crops for their ash in disregard of the properties of the soil and the physiological processes of plants and animals under careful observation as related thereto, is listed as a "kind of superb arrogance" by a "laboratory hermit."

Quantity has been our criterion of production by the soil even to the extent of detailed statistical treatment of the figures. But health and good nutrition do not depend on the quantity, rather on the quality of foods. On this aspect his protest against statistical manipulations is most outspoken when he says, "We cannot measure or weigh quality—and express the result in numbers which the statistician can use. But our livestock instantly appreciate quality and show by their preference, their better health, their improved condition and breeding performance how important it is. The animal, therefore, is a better judge of one of the factors that matters most in farming than is the mathematician."

There is a particularly strong protest against the use of mineral fertilizers. Organics are held up highly, but, unfortunately, by condemning the inorganics. This view forgets that even in the compost and the soil the microbes reduce to inorganic forms much that was in organic combination. This reduction is a prerequisite in order that many nutrient elements may repeat their cycles through decay and back through life again. It also forgets that the very first plant had no dead bodies of predecessors by which to build itself. Instead it started on a strictly mineral diet contributed by the rocky earth, an inorganic diet which helped it fabricate itself by using this in combination with air and water, all

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non-organic as starting materials. It also forgets that composting is an especially helpful means of putting minerals and nitrogen of that form into proteinaceous fertilizer products by combustion of highly carbonaceous wastes through microbial helps.

Composting as a practice should be understood in terms of the microbial physiology involved. It deserves wider use, has an excellent exponent in the author of the book, and also deserves all the scientific evidence that might well have been added.

Irrespective of any seeming omissions or shortcomings in the scientific aspects of this discussion on the organic aspects of the soil, this book deserves wide circulation and reading, whether by those urban or rural. Its style is excellent, its vocabulary extensive, its arguments logical, and its spirit constructive through impatience with the superficial. That it should manifest some righteous indignation makes it all the more interesting and generates admiration for the crusader's contentions. It will be read with mental profit by any one interested in things growing to serve him in his food and for his health.

WILLIAM ALBRECHT,
University of Missouri.

Reference Work on Official Drugs

PHARMACOGNOSY. George Edward Trease. 799 pages, illustrated, indexed. Williams & Wilkins Company, Baltimore. Fourth edition, 1945. $7.50.

Considered the foremost British text on the subject, this edition is slightly enlarged and revised that it may remain in keeping with recent developments in the field and the usual changes in the status of official drugs, both in Britain and in the United States.

The work would be greatly improved by the inclusion of the standards of quality, both general and specific, for the drugs listed and a more lengthy discussion of unofficial species which are of importance in industry. Although listed as a textbook it is of considerable value as a reference work, because of the number of research papers cited.

EDSON F. WOODWARD,
Pharmacognosist, S. B. Penick & Co.

Complete Guide to Pests And Their Control In Gardens

THE GARDENER'S BUG BOOK. Cynthia Westcott. 590 pages, color plates, index. The American Garden Guild, Inc. and Doubleday & Company Inc., 1946. $4.95.

This is a book for which we have long been waiting. It is one of the best books of its kind for use by the home gardener which has been published for a long while.

Dr. Westcott's easy, readable style has not detracted from the accuracy of the facts presented and she shows a varied and comprehensive knowledge of the many insects and other pests attacking flowers, trees, shrubs and vegetables grown by the home owner. The book is extensive, covering all parts of the United States with equal thoroughness.

I like the arrangement of the various chapters, and the subject matter presented is exceptionally good. In the chapter on "The Bugs" I find it a little difficult at times to locate some of the pests: there seem to be so many common names for the same bug! However, when in doubt Dr. Westcott advises us to look under the proper host plant in the next chapter, "Host Plants and Their Pests," and there we can usually find the bug. One can also use the index to good advantage.

Illustrations add materially to the interest of any book. We all like to look at pictures. The "Bug Book" is very well illustrated. The colored plates by Eva Melady are exceptionally good and cover many of the most common pests, showing the characteristic marks, the life history, and the injury of the insect. Here at Rutgers University, we were very fortunate in obtaining a complete set of colored kodachrome slides from the original plates. The line drawings in black and white are new and also very good.

One of the outstanding features of the "Bug Book" is the completeness of the field covered. Almost any insect likely to be found around the average home or estate can be located. The book is one which should be in the hands of everyone who is growing plants for pleasure or profit.

CLYDE C. HAMILTON,
Rutgers University.

Two Thousand Shrubs for the British Garden—Some for America

SHRUBS IN COLOUR AND CULTIVATION. T. C. Mansfield. 262 pages, illustrated. E. P. Dutton & Co., N. Y. 1946. $6.

This book was written for British gardens but should prove of more than passing interest to anyone who has learned to appreciate the immense variety and beauty of flowering shrubs. It describes over two thousand species and varieties divided amongst approximately 275 genera. There is no doubt that of the shrubs mentioned, and not already in cultivation here, there are many, particularly in the horticultural forms of the hardier species, that should prove hardy in this more severe climate.

The book consists of five brief chapters and a glossary. The first introductory chapter deals with the commoner mistakes in arrangement, and stresses particularly the evils of over-planting. Propagation describes standard methods such as can be applied by the advanced amateur. The chapter on transplanting begins with the spotting-out of seedlings and the growing of young plants, and more briefly with the moving of larger specimens. Maintenance is concerned principally with methods and times of pruning, and mention of the outlines of tree surgery; and the final chapter deals with soils.

All the foregoing occupies some 30 pages, while the remaining 232 comprise the glossary, which is the more interesting portion of the book. The genera are arranged alphabetically, each followed by the natural order, or family, to which it belongs. Then the derivation of the generic name is given, and after this come comments upon the characteristics, general use, and propagation of the genus as a whole. The meaning of the name of the species, and of many of the varieties is also given. The botanical name of each shrub is used exclusively, not its common name. The description of each shrub is written in popular language and as far as is possible under these conditions, gives its distinguishing features.

Following the description of each species and of the more outstanding varieties there is given in abbreviated and symbol form, the height; month of flowering; whether evergreen, semi-evergreen or deciduous; minimum space in square feet it will occupy at maturity; method of propagation; for some the flower color when matched with the Royal Horticultural Society's color chart; and type of soil it requires.

There are eighty plates in color photography which vary considerably both in color quality and definition. Many of the plates depict the flowers of more than one shrub, and in order that the reader may be sure he is studying the correct flower a celluloid template divided into twenty squares is provided. Each square is lettered, and at the foot of the plate letters follow the names of the flowers to indicate which squares on the template cover each flower.

J. H. Beale,
Boyce Thompson Institute

Nature as a Bee Would See It

PATTERNS IN NATURE. Photographs by Horst. 107 pages. J. J. Augustin Press, New York, 1946. $10.

Nearly half of the more than one hundred photographs by Horst assembled in this handsome publication were taken at the New York Botanical Garden in Bronx Park. The author-photographer has directed his camera with a nice feeling for pattern. His "bee's-eye" views of leaves, bark, flowers, shells, minerals, etc., show new relationships of texture, line, patterns of light and three-dimensional form. They have significance, as the shots were selected primarily for the visual patterns they presented to the camera's eye. The author, aware of the decorative potentialities of these designs in Nature, has concluded his book with ten composite plates made up of simple repeats of ten of the preceding pictures, which he considers "immediately" applicable to such industrial arts as textiles, wallpaper, plastics, ceramics, leather, and jewelry.

While it seems to me questionable that satisfactory decorative designs can be derived quite so literally from Nature, there is no question that this series of large photographs should provide the industrial artist with a rich source of ideas as points of departure for good ornamental design based on Nature, but at the same time obeying the laws of Art.

D. Graeme Keith,
Exhibits Assistant,
Cooper Union Museum.

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PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $15. (Temporarily out of print.)

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $6 postpaid.

The Bahama Flora, by Nathaniel Lord Britton and Charles Frederick Millspaugh. 695 pages. Descriptions of the spermatophytes, pteridophytes, bryophytes, and thallophytes of the Bahamas, with keys, notes on explorations and collections, bibliography, and index. 1920. $6.25.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50. Foreign postage extra.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. 50 cents.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants: eight plates in each number, thirty-two in each volume. Now in its twenty-second volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1.50 a year; single copies 15 cents. Free to members of the Garden. Now in its 47th volume.

Mycologia, bimonthly, illustrated in color and otherwise: devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.50 each. Now in its thirty-eighth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers published in co-operation with the American Society of Plant Taxonomists. Subscription price of volumes 1 through 5, $5 a volume ($4 to members of the Society). Now in its sixth volume. Price, $7.50 ($5 to members of the Society).

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

THE GARDEN IN SUMMER

DURING the summer the New York Botanical Garden is a mecca for travelers as well as for New Yorkers who are familiar with the coolness offered by the trees and the pleasant aspect of the gardens, borders, pools, and beds of flowers, vegetables, and herbs.

To those who are visiting the Garden for the first time, a leaflet, which is distributed free at the gatehouse and in the Museum Building, will serve as a convenient guide to the roads, paths, buildings, and plantings. Postcards and publications of the Garden are available in the Museum.

Plantings of special interest in midsummer are:

Borders of annuals, running the length of the path outside the Conservatory.

Perennials, at either end of the same greenhouse.

Waterlilies, in the Conservatory Court.

Rock Garden, east of the Museum Building, at its best in May but always worth a visit.

Vegetable Garden, near the northeast corner of the Conservatory.

Herb Garden, adjacent to the Vegetable Garden.

Shrubs and trees throughout the grounds.

Rose Garden, near the southeast corner of the grounds; between seasons in midsummer, but always colorful with bloom.

Conservatory, open daily from 10 to 4:30.

In the Museum Building, in addition to the permanent displays, two exhibits of water color paintings are on view:

Tropical Fruits by Lee Adams of Florida.

Insect Pests of Gardens by Eva Melady—the original paintings used to illustrate "The Gardener's Bug Book" by Cynthia Westcott.

The Museum is open daily from 10 to 5.

The Botanical Garden and all of its exhibits are free at all times, and the public is welcome.

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THE NEW YORK BOTANICAL GARDEN

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Fifth Annual Rose-Growers' Day Attracts A Record Crowd

A SINGLE day of good weather after prolonged rain and cold brought the roses at the New York Botanical Garden into unexpectedly good bloom for Rose-Growers' Day, and more than 300 people, a record crowd, attended the fifth annual gathering on June 11, arranged in co-operation with the second district of the American Rose Society.

The day opened with the customary informal tour of the garden in mid-morning, with Lambertus C. Bobbink and other rosarians discussing varieties of significance as they strolled along the paths and inspected bed after bed of bloom. The program, beginning at 11:30, consisted of a talk on "Roses in Landscaping" by Marian Cruger Coffin, landscape architect; "Report from Europe" by Robert Pyle, president of Conard-Pyle Company of West Grove, Pa.; and, after a picnic lunch beneath the trees, an address on "New Pest Controls in the Rose Garden" by Dr. P. P. Pirone, followed by questions and answers. During the time in which Mrs. Richardson Wright, who was ill, was to have spoken on "Roses for the Collector," Paul F. Frese, editor of *Flower Grower* magazine, conducted a rose queen contest. Among the score of roses suggested from those that had been seen during the morning, ***Crimson Glory,*** an old favorite, and ***Peace,*** a large yellow edged with pink, one of the newest roses, tied for first place with more than half a hundred votes apiece. Second choice was divided between ***Miss Rowena Thom,*** a large pink rose that has been a mainstay in gardens for many years, and ***California,*** a relatively new flower in glowing apricot tones.

Dr. R. C. Allen then introduced a number of the distinguished visitors of the day, calling on J. A. Armstrong of California and Lambertus C. Bobbink for short talks. Others whose names were called for a bow included Julia Clements, Associate Editor of *My Garden* magazine of London; Dr. Cynthia Westcott, the plant doctor, who announced the annual Rose Day on June 15 at her home in Glen Ridge, New Jersey; W. Ray

"Peace" rose, which shared top honors with "Crimson Glory" (shown on the opposite page) in the popularity contest conducted during Rose-Growers' Day.

"Crimson Glory" (left) and "California" (right), the latter ranking second with "Miss Rowena Thom" (shown on the cover) in the opinion of those who attended Rose-Growers' Day at the Garden June 11.

Hastings, Chairman of the All-America Rose Selections; Colonel Clifford Early, former President of the Georgia Rose Society; Mr. and Mrs. Harold L. Field, rose breeders of Rochester, N. Y.; Mrs. Charles Doscher, a member of the New York Botanical Garden and of the American Rose Society and an amateur rose grower of note, who challenged Mr. Armstrong's statement about the large size of roses in California, by saying that on Long Island she had hybrid teas from three to five feet high and hybrid perpetuals up to seven feet.

Others introduced included Martin R. Jacobus of Ridgefield, N. J., originator of ***Dream Girl*** rose; Mr. and Mrs. F. F. Rockwell and Ralph Bailey, all of *Home Garden* magazine; Joseph J. Lane of *House and Garden;* Miss A. L. Moran of Totty's, Madison, N. J.; Everett Piester, Superintendent of Elizabeth Park in Hartford, Conn., the first municipal rose garden in America; Mrs. Jerome W. Coombs, horticulturist and writer and a member of the Garden; Lester C. Lovett, nurseryman, of Little Silver, N. J., former president of the American Association of Nurserymen; Mrs. George M. Jameson and Mrs. H. B. Lacey of Culpeper, Va.; and Mrs. Paul J. Blackstone of Colonial Beach, Va.

Dr. B. O. Dodge introduced Dr. Pirone as his successor as Plant Pathologist at the New York Botanical Garden. Dr. Pirone's talk, as well as that of Miss Coffin, will be published in this Journal.

Mr. Pyle, who is president of the American Horticultural Council and past president and secretary of the American Rose Society, briefly de-

At the microphone is Marion Cruger Coffin. Talking with Dr. R. C. Allen (center) is J. A. Armstrong, who flew from California to attend Rose-Growers' Day.

scribed European conditions of food, transportation, and housing as he found them, and talked of the Bagatelle, the municipal rose garden of Paris, which is the scene every year of an international gathering for the selection of new roses; of England's Hayward's Heath, which serves a similar purpose, and of the Meilland nurseries at Lyons, France, from where he procured the rose which he introduced as ***Peace*** at the conclusion of the war. ***Peace*** was the choice of All-America Rose Selections in 1946.

He opened his talk with a tribute to the beauty of a rose garden and to the pleasure of knowledge about roses and their history.

"Nothing is more inspiring," he said, "than to see children coming into a rose garden; especially if there is someone with them to introduce them to the joys of rose growing. This is one of the fruits of liberty in America." He then told of the occasion when the Grand Duchess Charlotte of Luxembourg, visiting one of the large rose gardens in America during the war years, called for her national anthem as a symbol of the inspiration given by the beauty of that garden.

"Miss Coffin spoke appropriately of the importance of knowing plants better," he continued, "I wish that more people here could have the pleasure of knowing the background history of the persons for whom roses were named, such as Mr. Bobbink and I experienced only this morning in walking around this beautiful rose garden. As we looked at the roses and recognized them, we realized that nearly every one of them was named for a person whom someone saw fit to memorialize."

T. H. Everett served as general chairman for the day, with Dr. Allen conducting the morning program and Mr. Frese taking charge in the afternoon.

A Primrose For Naturalizing

By Aleita H. Scott

THOUGH the primrose is held in great affection by many gardeners, it is not at all an easy subject in the climate of eastern United States. In many gardens conditions are such that plants are likely to die out after a few attempts to get them established.

Primroses grow wild where the air is full of moisture, and where the summers never get very hot. Most of them thrive in the moist, cool conditions of England and in our own Northwest. In localities such as these, the varieties to which we must give the greatest care here in the East grow and thrive as do the wild flowers.

From my personal experience over a dozen years in growing a score of varieties of primroses in northern New Jersey, I have found only one that multiplies from year to year. All the others gradually fade from the scene unless I take pains to start new plantings from seed every few years. This one faithful grower is *Primula Sieboldii,* a native of Japan.

The leaves of *P. Sieboldii* are petioled and somewhat hairy, with the blade broad and fluted and irregularly lobed. The flowers are borne in a single terminal cluster on stems 6 to 8 inches tall. They are an inch and a half to two inches in diameter, and come in white, purple, lavender, and intermediate tints. *P. Sieboldii* somewhat resembles the pot-plant *P. obconica,* although I have never heard of its causing the skin rash that touching this beautiful pest is likely to cause.

There are two reasons, I think, in addition to its hardiness that make *P. Sieboldii* a good subject for naturalizing. The more important one is, perhaps, that it likes the naturally acid soil that we have in northern New Jersey and many other places in the region of New York. Of almost equal weight is the fact that this plant has the wisdom to go dormant before all of the difficulties of living through the summer in our climate bear down upon it. With me, it is among the first to bloom, accompanying *P. denticulata,* and by mid-June or early July it has disappeared from view. It has very stocky rhizomes that are obviously well prepared to keep the living elements within well taken care of until the following spring. Just at the time when the hot dryness of summer portends, these plants begin to lie low, so to speak. By so doing, they escape the hazard of white mite, which, like its relative, the red spider, is one of the most dreaded of the insect enemies of the host plant, because it is one of the most difficult to control. *P. Polyantha,* for example, may be destroyed in a few days in midsummer by an uncontrolled infestation of white mite. *P. Sieboldii* is dormant at this time, so there is nothing for the mites to feed upon.

I find that this primrose grows well at the outer edge of tree shade,

Primula Sieboldii thriving among other spring flowers in a naturalized planting at the edge of a light wood.

where morning sunlight reaches it during the spring. It does not thrive well in deep shade. During summer months, the rhizomes do better if concealed and covered by nearby plants. I have one clump of *P. Sieboldii* that is maintaining itself satisfactorily against ivy and myrtle. However, in such a spot, it does need a little help against such aggressive neighbors! It does well in association with *Mertensia virginica* and *Brunnera macrophylla* (found in most catalogs as *Anchusa myosotidiflora*).

Primula Sieboldii is probably at its best along a lightly shaded woodland walk. It is more than agreeable to have a choice flowering plant that thrives on neglect yet that never grows so rampantly as to become a weed.

Naranjillas, or "Little Oranges" Of the Andean Highlands

By W. H. Hodge
University of Massachusetts

Photographs by the Author

IN South America, and particularly in the Andes, the Nightshade family, or Solanaceae, attains its greatest development. It is understandable then that one of its principal genera, *Solanum*, which has given us such important plants as the potato and eggplant, might contain several other species which have found their way into the dietary of the Andean people. Although unknown elsewhere, these plants are often quite important economically in their homeland. One of them is *Solanum quitoense*, the so-called NARANJILLA or "little orange" of Ecuador. The popular name, which refers to the small, orange-colored, spherical fruits, is a fanciful misnomer, for no one at close look would confuse the fruit with an orange. As one Ecuadorean agriculturist has pointed out, a more descriptive name would be TOMATILLA, or "little tomato," for aside from the color, the fruits resemble the garden tomato in growth, skin texture, and internal appearance.

Mature naranjillas are actually thicker and firmer-skinned than tomatoes, but the pulp, which is greenish-orange rather than red in color, closely resembles that of a tomato both in juiciness and in its number of small greenish seeds.

The abundance of juice makes it eminently popular in Ecuador as the source of a refreshing and foamy drink, or SORBETE, which is in as much

demand among Ecuadoreans as are orangeade and tomato juice with us. Naranjilla juice is slightly on the acid side and usually requires sweetening with sugar to the same extent as grapefruit juice. It has a flavor all its own, though to the writer its taste most closely approaches that of the juice of certain species of the passion-flower, such as *Passiflora mollissima* of the Colombian Andes. In Quito, Ecuador's capitol, freshly-squeezed and flavorsome naranjilla juice is a favorite and inexpensive fountain drink in which all classes indulge—and rightfully; for, besides being packed with vitamins, the juice is also rich in albumin and pepsin, lime, magnesium, and phosphate.

Foreigners also find the juice delicious, and there has been much talk of canning and exporting it to the United States, where it is believed it would meet with much favor. Unfortunately, this potential export trade has not been realized, because of the loss in flavor brought about by pasteurization and the addition of antifermentants in the canning process. Undoubtedly technological research by canning interests can overcome these present difficulties.

Although naranjillas are most popular in the form of the expressed juice, they are commonly eaten raw or made into various other items such as marmalade and pie. They are sometimes stuffed, often with bananas, and then baked, topped with meringue, to give a rather delicious and unusual dessert.

The plant itself is a coarse succulent herb which, under normal conditions, can attain a height of eight feet, with leaves two feet long. Although the giant leaves, which are frequently armed with short sparse thorns, are ordinarily dark-green above, certain of them, especially the younger ones, are purplish-colored beneath. The white flowers, which are typically solanaceous, show the same hue on the pedicels.

In fact, a characteristic of the species is the dense plushy covering of soft hairs found on all parts of the plant, even the fruit. Most of the fruit hairs are rubbed off during harvesting and transporting, but they may prove irritating when the fruit is first picked for they easily pierce tender skin with the same scratch-inciting effect that one would get from a tuft of opuntia hairs.

The flowers are borne in corymbose clusters at each node, and they mature eventually into dozens of bright-orange, globular fruits two inches in diameter. Since the flowers are produced continuously on the new growth, fruits likewise are continually maturing at the lower nodes of the same plant. Hence the naranjilla harvest is a year-round one.

Solanum quitocnse seems to thrive best in moist Andean valleys lying close to the equator and at elevations averaging between 4,000 and 7,000 feet. Since Ecuador is its native country, the species, as might be expected, ranges pretty well throughout its length, from the Colombian frontier

THE NARANJILLA AND ITS FRUITS AND FLOWERS

Above, a young naranjilla plant. Left, the potato-like flowers, which are typical of the genus Solanum. Right, a heavily producing plant near the Río Negro in Antioquia, Colombia. Note the felted hairs on the young leaf growth and on the fruits.

south into the province of Loja, where it is to be found in the valley of the Guangocolla River. The most important producing area for this refreshing fruit lies in the Pastaza River valley of central Ecuador in the vicinity of Baños. The importance of the naranjilla crop in this district is linked with the fact that this is the path of the only auto road running into the Ecuadorean Oriente. Available transportation thus has helped in the development of this herbaceous crop. The naranjilla also is to be found cultivated in Colombia, at least as far north as Medellín, but it does not appear to range southward into Peru. In Colombia it goes under the name of LULU.

The naranjilla seems to be a fruit of rather recent development or use, although it has probably been grown locally in the valleys of central Ecuador since long before the Conquest. Unlike many other plants of the Andes which were at least briefly mentioned by the chroniclers, to the best knowledge of the writer this fruit lacks any mention in the early records. And the fact that it is not known today in Peru, in the old Inca area, would appear to show that it had not been observed by representatives of those agriculturally minded peoples when they brought the land of the Quitus into subjection just a few years before the Spanish Conquest. Since the Conquest the plant has migrated more toward the north than to the south.

Naranjilla culture is relatively simple. Seedlings are grown and transplanted to the fields just like tomatoes. The plants, with a life-cycle of about three years, require well-drained, sloping land where they will begin producing about fifteen months after they have been set out, and will continue with fruit for the balance of their life-cycle. During this period they so exhaust the soil that it is generally worthless for most other tropical crops except cane. An acre of plants will yield during its fruiting period from ten to twenty-five tons of fruit. It is estimated that Ecuador produces only about 2,000 tons of naranjillas annually, and two-thirds of this production originates in the Baños region. As might be expected, the great bulk of this crop is sent to hot humid Guayaquil where cool refreshing drinks are more in demand than in the highland capitol. Even so, the fruits are familiar items in the market-places of all the principal highland towns of Ecuador and southern Colombia.

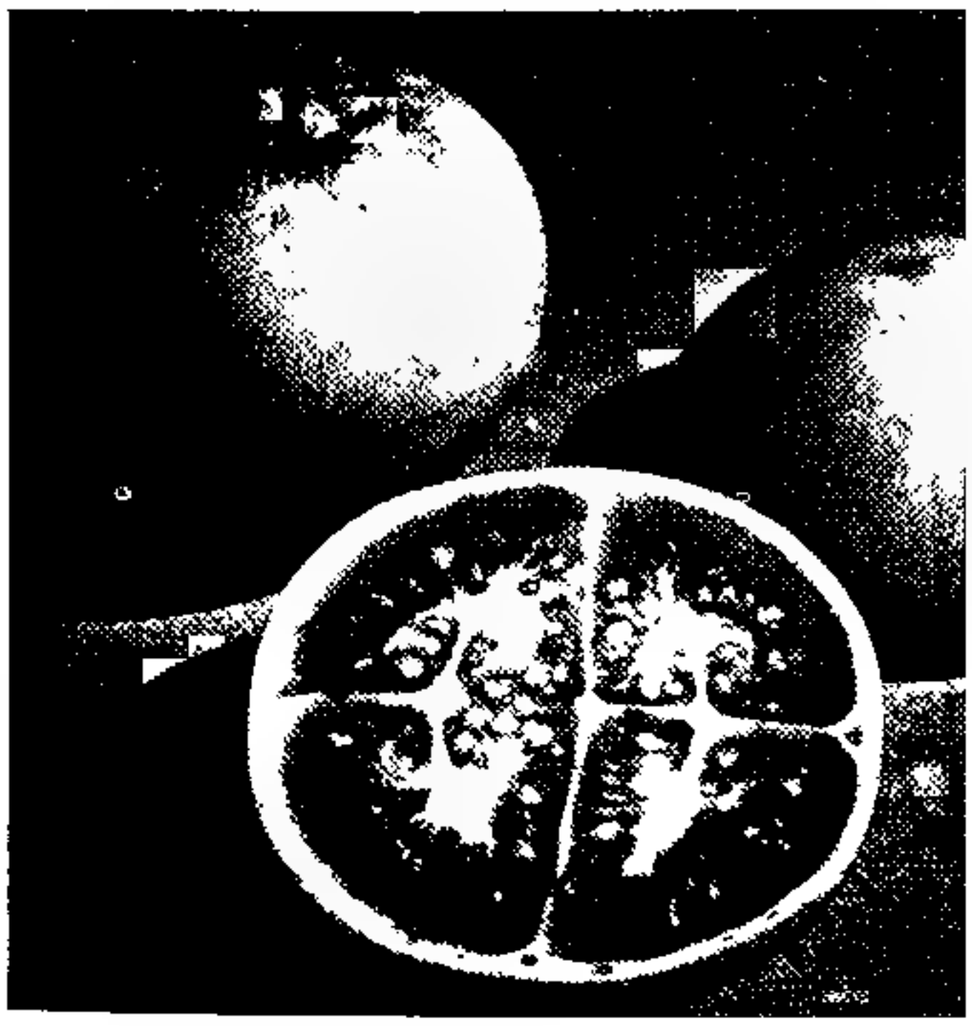
Unsuccessful attempts apparently have been made to grow the naranjilla in the United States south of the frost belt, in sub-tropical Florida and California. The plants are said to have produced abundant foliage and a few flowers but no fruits. The evidence suggests that this species, like many others native only to equatorial latitudes, requires the ratio of day and night to which it is accustomed in its home. So even though the soil, temperature, rainfall, and altitude of Ecuador could be duplicated in our country—which would not be possible, for at the same altitude in North America, other factors are not the same—the plant would still fail of suc-

cessful acclimatization as a useful crop. Thus if the naranjilla is to expand its popularity and use in this hemisphere, as it richly deserves, it still may have to be produced close to the equator in its homeland, the Andes of Ecuador, or in the mountains of neighboring Colombia or Venezuela.

Some Additional Comments On the Naranjilla

SIMILARLY interested in wider use of the naranjilla as a juice-fruit, in 1945 *Dr. W. H. Camp brought back from Ecuador seeds collected from fruits grown near El Topo in the Oriente below Baños. The plants have grown well in the greenhouses at the New York Botanical Garden, and have been exhibited on several occasions because of the interesting leaves with purplish-colored pubescence. They flower freely, but attempts to get them to set fruit have so far failed. Because of this, Dr. A. B. Stout, who is always interested in problems of sterility, investigated some of the flowers. He reported that the pollen apparently was abortive in the material he examined.*

Dr. Camp made further comment as follows on the possibility of growing the naranjilla far outside of its native habitat.



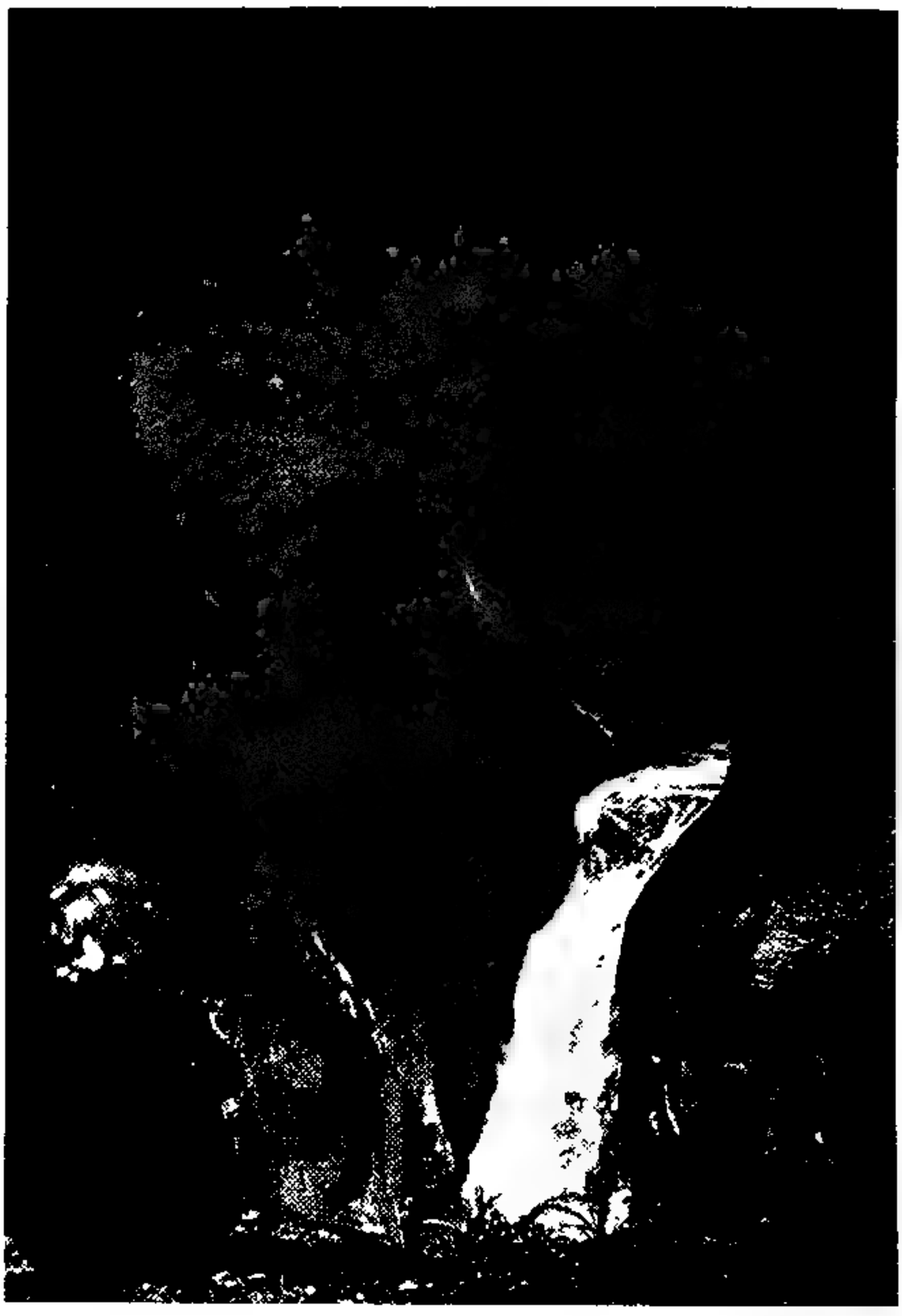
Tomato-like fruits of the naranjilla (Solanum quitoense).

"As Dr. Hodge has pointed out, the naranjilla exhausts the soil; it is equally true that it requires a very rich soil for the production of a profitable crop. The amount of precipitation along the Río Pastaza varies greatly, increasing steadily from its origin at the confluence of the Ríos Chambo and Patate through Baños, mentioned by him, to La Gloria, near El Topo (where, if I can judge by his photographs, his observations were made), and thence eastward to the base of the Andean escarpment. It is my estimate that the El Topo region (by far the heaviest producing area) has about 175 inches of rainfall per year—and it may be more.

"With this heavy rainfall cultivated soils are leached at such a rate that continuous agriculture of a normal type is not and never has been profitable. As a result, to obtain a crop of naranjillas

it is necessary that a stretch of jungle forest be cleared just before the brief dry season and burned so as to obtain sufficient minerals for a single crop. And it is years before another profitable crop can be raised on the same ground. Because of this, it is my opinion that the naranjilla probably never will be a profitable crop if attempts are made to produce it on a large scale where it seems to grow best.

"However, if it is desired to grow the naranjilla in other latitudes, there is no reason why attempts should not be made to select forms for fruitfulness outside of the equatorial belt. Very few tropical crops have been successful when first introduced into other regions, but, through selection and hybridization, many have in time become satisfactorily established. Although attempts have been made to grow this fruit crop here, as yet apparently no one has tried to discover special types of the naranjilla that might be suitable for culture in, for instance, southern United States."



Steep mountain slopes in the vicinity of Baños. Ecuador, where the naranjilla grows.

Three New Staff Members Appointed

THE first day of July, of August, and September will see a new member added to the scientific staff of the New York Botanical Garden. The three are, in order, Dr. P. P. Pirone, Dr. Richard A. Howard, and Dr. Donald P. Rogers. Biographical notes on each are given on the next two pages.

Dr. Pirone, Plant Pathology

SUCCEEDING Dr. B. O. Dodge, who retired Jan. 1, Dr. P. P. Pirone comes to the New York Botanical Garden as Plant Pathologist July 1. For the past ten years he has been Associate Professor of Plant Pathology at Rutgers University, New Brunswick, N. J. In 1942, '43 and '44 he was one of the instructors in the Botanical Garden's Two-Day Short Course in Disease and Pest Control. He is the author of "Maintenance of Shade and Ornamental Trees," a volume of more than 400 pages, published in 1941 by the Oxford University Press.

Dr. Pirone was graduated from Cornell University in 1929 with a Bachelor of Science degree. He had already begun his professional work in plant pathology by working on vegetable diseases for the A. A. Grinnell Company at Elba, N. Y., during 1927 and '28. Through an appointment on a Farm Bureau Fellowship, he continued his work on vegetable diseases for four years in Nassau County on Long Island, while working for his Doctor of Philosophy degree.

The Ph.D. was awarded in 1933. The Dutch elm disease broke out about that time, and Dr. Pirone went to work at once for the Bureau of Plant Industry of the United States Department of Agriculture, serving as field assistant and project leader for eradication of the Dutch elm disease in New Jersey and in White Plains and Hempstead, N. Y.

In 1934 he returned to Cornell as Extension Assistant Professor of Plant Pathology, being placed in charge of research on diseases of ornamental plants two years later. Then in 1938 he went to Rutgers as Associate Professor.

In addition to his book on tree care, Dr. Pirone is the author of many technical papers and popular articles, the former including descriptions of three new species of bacteria which he has discovered causing diseases on gardenias, dieffenbachias, and poinsettias. With other authors he has also written on leaf-spot diseases, London plane blight, and gardenia cankers, and he has translated from the Italian an early 19th century work on rust of grain. The New Jersey Agricultural Experiment Station in 1939 published an 80-page circular, "Diseases of Ornamental Plants," the revision of which he prepared.

At the New York Botanical Garden he will have charge of disease and pest control on all the ornamental plantings, and he will undertake research on diseases of ornamental plants.

Dr. Dodge will retain his office at the Garden for the continued pursuit of his investigations on *Neurospora* and on plant diseases in which he has developed special interest.

P. P. Pirone

Dr. Howard, Tropical Botany

TROPICAL American botany will be the special field of research for Dr. Richard A. Howard, who will join the staff of the New York Botanical Garden as Assistant Curator August 1. Dr. Howard comes directly from Harvard University, where he resumed his teaching upon being discharged from the Army in February 1946. During the war he first served as instructor to medical officers at the Army Air Force School of Aviation

Richard A. Howard

Medicine, Randolph Field, Texas, then was selected to organize and direct the AAF Survival Training Program and the Jungle Survival School at the AAF Tactical Center, Orlando, Florida. For this work, as a Captain in the AAF, he received the Legion of Merit, the second highest non-combat award.

Dr. Howard majored in botany at Miami University, Oxford, Ohio, from where he was graduated in 1938. He became a teaching fellow at Harvard in 1939 and received his Master's degree there in 1940, his Ph.D. in 1942. He is a member of Sigma Xi and several other scientific societies.

Field work has taken Dr. Howard into New England, western United States, northern Mexico, Florida, Cuba, Puerto Rico, and the Dominican Republic. He is now making studies of the Dominican flora and of the plants of certain parts of Cuba. He has already published a series of articles on Caribbean plants.

For the AAF he prepared survival manuals and for press releases during the war he wrote extensively on the utilization of plant and animal materials as emergency foods.

Taxonomically, he is chiefly interested in the application of comparative anatomical and morphological data to support taxonomic and phylogenetic research, and he is using this method particularly in his studies of the Icacinaceae.

Dr. Rogers, Mycology

DR. DONALD PHILIP ROGERS, now at the University of Hawaii, will come to the New York Botanical Garden as Curator in the Cryptogamic Herbarium September 1.

A graduate of Oberlin College in 1929, Dr. Rogers received his Doctor of Philosophy degree from the University of Iowa in 1935. He served in the meantime as assistant in botany, Nebraska, 1929-30, and in the same position at Iowa from 1931 to 1935. He was a National Research Fellow at Harvard during the following year, and Instructor in Botany at

Donald P. Rogers

Oregon State College from 1936 to 1940. Another year of research at Harvard followed, then a year as Instructor of Botany at Brown University, this position followed by three years (1942-45) as Associate Professor of Biology at American International College, Springfield, Mass. During the summer of 1945 he was the recipient of a scholarship at the New York Botanical Garden, but his work was cut short by an offer to go to the University of Hawaii as Assistant Professor of Botany.

Recently Dr. Rogers made a collecting trip to the Marshall Islands with other botanists from the University. Using Kwajalein as a base, the party visited a number of the nearby atolls, some by seaplane and some by the LSM vessel on which they were sailing. His paper on the fungi of the Marshalls which appeared this year in *Pacific Science* (Vol. 1, pages 92-107), is the first of a series he expects to publish. At the Garden he plans to continue his studies on the Marshall collections, as well as on material he has gathered in Hawaii. He has done extensive field work also in Massachusetts, Rhode Island, Iowa and Oregon. His principal field of research is in the comparative morphology and taxonomy of the Basidiomycetes, with special attention to the Thelephoraceae. Of the score of technical papers he has written, seven are cytological, one of these is concerned also with phylogeny, one is nomenclatorial, several are bibliographic, and the rest are purely taxonomic. Five of these have appeared in *Mycologia;* two others have been submitted to this periodical.

Dr. Rogers is a member of the Mycological Society of America, the British Mycological Society, Sigmi Xi, Botanical Society of America, A.A.A.S., and the Torrey Botanical Club.

Abel Joel Grout—Vermonter and Bryologist

By Inez M. Haring

SINCE the early 1600s, when the Grout family first came to America, generation after generation was reared amid the tree-clad slopes of the Green Mountains in Vermont. Abel Joel Grout, Honorary Curator of Mosses at the New York Botanical Garden, whose life came to an end on March 27, three days after his eightieth birthday, had known the hills of Windham County ever since his birth on a farm at the edge of Newfane, March 24, 1867. It was there that, as a boy, as a youth, and as a man, he roamed the countryside, learning at an early age to know first-hand where all the rare as well as the common plants grew. It was there that his life-interest in mosses was generated, there that he studied them in books and in the field while other boys were at play. And it was there that, for a number of years, he conducted a six-weeks summer school for advanced students of bryology at his home, Moss Rock Cabin, at Newfane.

Although Dr. Grout was a high school teacher of science most of his life, his technical studies of the mosses absorbed him all through the years, and he was the inspiration for many amateurs and professionals in the study of bryophytes.

His early education was obtained at the local grade school in Newfane, then at the Brattleboro high school. From the University of Vermont he received the degree of Bachelor of Philosophy in 1890. Determined to continue work toward a doctor's degree, but lacking the funds, he turned

ABEL JOEL GROUT
1867-1947

to teaching science. While at the Vermont State Normal School, in 1893, he met and married Grace E. Preston, also a teacher. The determination to obtain his doctorate never lagged, and through those early, lean, and struggling years she gave courage, aid, and inspiration. In fact, all through the 53 years of their married life, she contributed much toward her husband's career. In 1897, Abel Joel Grout received the degree of Doctor of Philosophy from Columbia University, taking as his thesis a study of the moss group Brachythecieae.

For two years he taught at the State Normal School at Plymouth, New Hampshire; then for nine years more at the Boys High School in Brooklyn. From there he went in 1908 to the Curtis High School on Staten Island, where he remained until 1930. In that year he was appointed to the research staff of the Biological Laboratory at Cold Spring Harbor, Long Island, where he received both co-operation and financial help for his bryological studies.

He was one of the founders of the Sullivant Moss Society, and shortly after, under its auspices, he founded *The Bryologist,* the first number of which appeared in 1898. During the years he contributed much to this

bryological journal, including descriptions of many new species that he named. He served as editor for the first few volumes and again in 1911 and 1912. At the time of his death he was on the board of associate editors. The fiftieth anniversary number, issued in March of this year, is dedicated to him on the occasion of his 80th birthday.

Early in his career Dr. Grout began issuing *North American Exsiccati,* which he distributed to private collectors, institutions, and universities all over the world, up to the time of his death. The series represents practically all moss species known in the United States. His own large herbarium, including several hundred slides, was purchased some time ago by Duke University. His library contained many rare books of early writers on mosses, as well as a very complete collection of books and monographs in current circulation.

Dr. Grout's own published works were many. In 1900 he issued his first book—"Mosses with a Hand-Lens"—designed to aid the beginner. This went into four editions. "Mosses with a Hand-Lens and Microscope," published in five sections from 1903 to 1910, was still a non-technical hand-book designed for general use. These books were followed by what Dr. Grout termed his life-work—"Mosses of North America North of Mexico"—published from 1928 to 1940 in 12 parts, three volumes of four parts each. This set was written for the scientific student of mosses and it stands today as the authoritative work in its field. Other American bryologists contributed to the studies. Fearing lest he might not be able to finish during his lifetime, Dr. Grout spent relentless hours at work in order to bring this work to conclusion. The early work that he did for *North American Flora,* which was interrupted for many years, was resumed after 1940, and the first published number of this recent work, the Fissidentaceae, came out in 1943. A study of the Orthotrichaceae appeared in print in 1946. The balance of his recent studies for *North American Flora* will be published posthumously.

Dr. Grout was a Fellow of the American Association for the Advancement of Science; President of the Florida Botanical Garden Association, 1935-1937; and President of the Historical Society of Windham County, Vermont. He was particularly proud of his appointment as Honorary Curátor of Mosses at the New York Botanical Garden in 1941, for as a young man and through the years that followed he had worked and consulted often with Elizabeth Gertrude Britton at the Garden. Although at times differing radically from her in opinion, he always felt he owed her a debt of gratitude for her co-operation as well as her valued criticism.

Dr. Grout had been much depressed by the death of Mrs. Grout last February 14, and did not seem to be able to adjust himself to the new conditions. His death occurred, after three days' illness with pneumonia, at his winter home at East Bradenton, Florida. A double service was held for him and his wife May 4 at Newfane, Vermont.

Henry de Forest Baldwin

THE oldest member of the Board of Managers of the New York Botanical Garden died May 18 at the age of 84. He was Henry de Forest Baldwin, one of the Garden's Vice-Presidents. Mr. Baldwin was elected to the Board of Managers January 10, 1921, to succeed Francis Linde Stetson, who had died the month before. At the same time Mr. Baldwin became a member of the Corporation.

Seven years later he was named Vice-President, and he has served in that capacity since that day. He was also made a member of the Executive Committee in 1928 and two and a half years later was appointed Chairman of the City Relations Committee, a post which he also held until the time of his death.

At the ceremony at Fordam University May 24, 1945, at which Dr. William J. Robbins was awarded an honorary degree of Doctor of Science, Mr. Baldwin represented the Board of Managers in a historical address on the New York Botanical Garden.

A New York lawyer since 1887, Mr. Baldwin had long been interested in reform politics and in adult education movements. In the resolution passed by the Board of Managers May 27 it was said: "He served faithfully on various committees besides contributing generously to its [the Garden's] funds. He gave the Garden untiring devotion, and his tact and considerateness in dealing with its affairs made his influence dominant in its councils."

Puerto Rican Expedition

LIVING specimens of approximately 80 species of plants are now being grown at the New York Botanical Garden as a result of the two-week expedition in Puerto Rico made the last of May by E. J. Alexander. These were selected for greenhouse culture (or for outdoor culture in the southern states) from approximately 250 species of living plants that were collected. About half of them are ferns, mostly species that have never before been grown in the United States. Of these, several are small species from the Tree Fern family, and one is a creeping, lycopodium-like plant. Spores of most of the ferns were also collected, as well as seeds of a number of flowering plants.

Among the flowering plants are several bromeliads of particular interest, notably *Thecophyllum Sintenisii,* with red leaves and red flower spikes; *Vriesia macrostachya,* a gigantic plant with both flowers and leaves of green; and the endemic *Guzmania Berteroniana.* So far as is known, the only other specimen of this ever brought into the United States once grew at the New York Botanical Garden and was illustrated at the time in *Addisonia.*

Mr. Alexander was accompanied by Alfred Graf of Julius Roehrs Nursery Company of East Rutherford, N. J. The expedition was sponsored by Charles F. Pennock of the North-South Nursery Company of San Juan, Puerto Rico, who presented the Garden with a number of rare and interesting plants from his nursery, among them the rare endemic, *Philodendron Nechodomi.* This is a climber with pinnate leaves.

Among the choice native plants collected in the wild is a forest vine with large racemes of coral-pink flowers, *Neorudolphia volubilis.* It is a close relative of *Erythrina* which the flowers resemble, and is believed to be known only from that region. Another pink-flowered treasure brought back from Puerto Rico is *Alpinia antillarum,* also new to American horticulture. Among other species of particular interest in the collection are seeds of *Marcgravia Sintenisii* and plants of a spicy-scented *Peperomia.*

A token of seedlings and seeds of the sawarie nut (*Caryocar nuciferum*) was presented by Mr. Alexander for the New York Botanical Garden to Governor Jesus T. Piñero of Puerto Rico. The seedlings have been grown from nuts sent to the Garden by Dr. Gerold Stahel, Director of the Agricultural Experiment Station at Paramaribo, Surinam, where the tree is native.

Notes, News, and Comment

Honor. Dr. Fred Jay Seaver was one of 99 distinguished alumni to be honored with a Certificate of Accomplishment at the centennial celebration of the University of Iowa at commencement exercises June 7. Dr. Seaver received his Master's and Doctor's degrees from

Iowa in 1904 and 1912. In the group of selected alumni were two other botanists, one of whom, Dr. F. D. Kern, head of the department of botany and dean of the graduate school at Pennsylvania State College, did research for his Ph. D. at the New York Botanical Garden, as did Dr. Seaver. The third botanist in the group, Dr. John T. Buchholz, Professor of Botany at the University of Illinois, was once a freshman student under Dr. Seaver at Iowa Wesleyan College.

Associate Curator. Commencing July 1, Edward J. Alexander becomes Associate Curator at the New York Botanical Garden. He has been a member of the staff since 1926, having been appointed Assistant Curator, to work under Dr. John K. Small, shortly after coming to the Garden as a museum aide. In 1932 he was also named Curator of the Local Herbarium, a post which he continues to hold. He has been Editor of *Addisonia* since 1929.

Beginning his botanical expeditions by accompanying Dr. Small to the southern states in 1930 and 1931, Mr. Alexander made collecting trips with T. H. Everett, Horticulturist, in the southern Appalachians in 1933 and in the Rockies in 1936. Leaving New York near the end of 1944, he spent most of 1945 in southern Mexico, bringing back about 6,000 herbarium specimens of some 1,200 different kinds of plants and propagating material of nearly 1,000 species. A brief collecting trip to Puerto Rico, made in May of the current year, is reported elsewhere in this Journal.

Mr. Alexander's technical and popular publications number nearly 200, those of recent years being chiefly on succulent plants and especially on the Crassulaceae. He is also the author of "Succulent Plants of New and Old World Deserts" and co-author with Carol H. Woodward of "The Flora of the Unicorn Tapestries," both published by the Garden from series of articles in the Journal.

Resolution. At the first meeting of the Board of Managers since the death on Feb. 9 of H. Hobart Porter, a member of the Board since 1926, a resolution of regard for his services was passed and transmitted to his family. The resolution read in part: "He was honored by all his associates for his sincerity, sound business judgment and understanding of financial conditions, but above all he was esteemed for his friendly personality and qualities as a man."

Honored. Dr. B. O. Dodge was one of three retiring botanists to be honored by the Torrey Botanical Club at a dinner at Hunter College May 27. He was introduced by Dr. H. A. Gleason. The other two guests of honor were both from the Brooklyn Botanic Garden—Dr. Alfred Gunderson, who was introduced by Dr. W. H. Camp, a member of the executive committee of the Torrey Club, and Dr. Arthur Harmount Graves, introduced by Dr. John A. Small of New Jersey College for Women, chairman of the field committee for the club. The three guests all gave short talks on their careers. Dr. George H. Shull, recently retired from Princeton, presided.

Manual Reprinted. A new edition of H. A. Gleason's "Plants of the Vicinity of New York" is ready for distribution at $2 a copy. This popular manual has been out of print for several years, while the demand for it has continued. It contains keys and brief descriptions of the plants most commonly found within 100 miles of New York, and is designed for use by the layman who is not necessarily versed in botanical terminology.

Tapestry Booklet. "The Flora of the Unicorn Tapestries" by E. J. Alexander and Carol H. Woodward, first published by the Garden in 1941 and out of print for the past two years, has been reprinted by offset in a new edition. The price remains at 25 cents a copy. Shortly after the first edition appeared, James J. Rorimer, Curator of The Cloisters, published in the Bulletin of the Metropolitan Museum of Art, results of his studies on the history of the famous tapestries. This new material, indicating that the tapestries were apparently made for Anne of Brittany, is included in the new edition of the booklet.

Chemists. Members of the New York section of the American Chemical Society had their annual outing at the New York Botanical Garden June 7. A talk on the Garden, its facilities and services, followed by a showing of "The Gift of Green," was given by Dr. William J. Robbins both morning and afternoon in the lecture hall. At the same time, a

choice of three conducted tours was offered—to the Rock Garden, the Hemlock Forest, or the Conservatory. Lunch was served in the Members' Room by the society to its officers and to staff members who were assisting for the day.

Garden Club Day. The second annual Garden Club Day at the New York Botanical Garden brought about 400 visitors to the grounds May 20. The program presented in the Lecture Hall at 11:30 was designed to acquaint the visitors with the ways in which the New York Botanical Garden serves the public. Under the title of "The Amateur Asks—The Experts Answer" a forum was conducted with T. H. Everett as chairman. He was assisted by Drs. H. N. Moldenke, W. H. Camp, and Bassett Maguire, E. J. Alexander, Elizabeth C. Hall, and by his secretary, Mrs. Helen Scott. Each staff member repeated specific questions that had come to him or her in the mail, then gave the answer that was prepared for each question.

After a picnic lunch, the garden club guests were given their choice of guided tours of the Conservatory, Hemlock Forest, Thompson Memorial Rock Garden, and the spring flowers, trees and shrubs. Flowering cherries, dogwoods, lilacs, azaleas, English wallflowers, and bright borders of perennials were among the many other fine outdoor displays.

Advisory Council. Mrs. Elliott Averett of Chatham, N. J., was elected a member of the Advisory Council at the Board of Managers meeting held May 27.

Radio. Carol H. Woodward spoke on "Spring Flowers at the Garden" on the Modern Farmer Program over WNBC April 24 and on "How the New York Botanical Garden can be of Service to Gardeners" for the American Women's Voluntary Services on WNYC May 9. Dr. E. E. Naylor spoke on "Vegetative Propagation" on the Modern Farmer program May 26.

Tabea Hofmann, whose flower paintings were on exhibit in the Museum Building at the Botanical Garden during May, was guest speaker on Becky Reyher's program "Fun with Your Children" May 25 over WNYC.

Petunia Investigation. Rev. Thomas D. Sullivan, S.S.E., received the degree of Doctor of Philosophy at Fordham University on June 11. Dr. Sullivan's thesis on "Somatic Chromosomes of Pedigreed Hybrid Petunias" was based on the cultures of polyploid petunias grown at the New York Botanical Garden for the investigations by Dr. A. B. Stout.

Geographic. Leading article in the *National Geographic Magazine* for July is "The World in Your Garden," a geographical history of gardens and garden flowers by W. H. Camp. Twenty-four color plates by Else Bostelmann show, against a background of a characteristic scene of each region, familiar American garden flowers which have originated in different sections of the world.

Lectures. Dr. E. E. Naylor presented the films "Plants and the Life of Man" and "The Gift of Green," along with a short talk on the New York Botanical Garden and some of its functions, to the Floriculture Club and members of the Botany Department of Cornell University May 13. While there, he was a guest at a luncheon honoring Dr. L. H. Bailey, at which Dr. Bailey gave interesting accounts of his life and explorations in search of palms.

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"Daylilies: Old and New" was the topic of a lecture given by Dr. A. B. Stout, May 12, to the Watnong Garden Club at Morristown, N. J. The Watnong club has recently become an affiliate member of the New York Botanical Garden.

The Westfield, N. J., Bird Club heard Dr. H. N. Moldenke, June 2, speak on "Marvels in Adaptation among our Local Plants." On May 12, Dr. Moldenke lectured on "A Naturalist in Florida" to the biology faculty of Evander Childs High School.

G. L. Wittrock addressed the science class of the State Agricultural and Technical Institute at Farmingdale on the subject of "Economic Botany" the evening of June 4.

Dr. O. B. Dodge presented a discussion of the types of diseases of plants, relating them to diseases of humans, in a lecture before the students of medical mycology in the Department of Dermatology, Columbia University, at Physicians and Surgeons Hospital June 2.

Chicago Meeting. Dr. Marjorie Anchel attended the meeting of the Federation of American Societies for Experimental Biology held in Chicago May 18 to 24.

Summer Workers. Dr. Arthur Cronquist, now at the University of Georgia, Athens, Ga., is spending July and August at the Garden to complete his work on the treatment of the Compositae for the new illustrated flora of the northern states.

Mrs. Inez Haring of Poughkeepsie is working at the Botanical Garden a month or so during the summer on mosses.

Visitors. Dr. John Hendley Barnhart, who has been a member of the staff of the New York Botanical Garden since 1903, worked here a few days during June.

Dr. J. W. Martin, Professor of Botany at the University of Iowa, spent a month at the New York Botanical Garden completing his manuscript on the Myxomycetes for *North American Flora.*

Neil Hotchkiss of the Fish and Wildlife Service, Washington, D. C., visited the Garden June 16, studying aquatic and marsh plants.

From Turkey came Baki Kasapligil, Assistant in Botany at the Ankara Higher Agricultural Institute, to visit the Herbarium.

Other recent visitors have been Michael Evenari, Department of Botany, Hebrew University, Jerusalem; Robert T. Clausen, Cornell; M. A. Chrysler of Rutgers University; Daniel Tannenbaum from Middlesex University, Waltham, Mass.; C. O. Rosendahl, University of Minnesota; Lewis S. Rose, California Academy of Sciences, San Francisco; and W. Lawrence White and May H. Downing from the Biological Station at Philadelphia.

Juniper Book Published

P. J. VAN MELLE, nurseryman of Poughkeepsie, N. Y. is the author of "Review of *Juniperus chinensis,* et al," published April 30 by the New York Botanical Garden. The book represents the result of many years of study of living plants, as well as of specimens in the leading herbaria of the East. Mr. van Melle's own herbarium specimens, collected from the living plants he has studied, have been deposited at the New York Botanical Garden.

The book takes up the many varieties and forms of *Juniperus* which have been "commonly included in the current, loose concept of *J. chinensis.*" The author lists more than 100 names that have appeared in literature, and he reclassifies the junipers of this group in the light of his own investigations. The book is illustrated with a dozen full-page plates of various forms of *Juniperus.* There is a key to the species, also a supplementary key headed "Distinctive Characters of the Varieties and Formae." The book totals 108 pages, and is priced at $2.

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NOTICES AND REVIEWS OF RECENT BOOKS

Conversations With a Famous Plant Explorer

THE WORLD GROWS ROUND MY DOOR — The Story of The Kampong, a Home on the Edge of the Tropics. David Fairchild. 347 pages, illustrated, indexed. Scribner, New York 1947. $5.

Dr. Fairchild has had quite a retinue of readers who have followed him around the world for fifty years, as he has explored for plants, cherishing his magazine articles and books. Now they all settle down to talk it over, in The Kampong, the home of Dr. and Mrs. Fairchild in Coconut Grove, Florida. The book is dedicated to "Marian," Mrs. Fairchild, the daughter of Dr. and Mrs. Alexander Graham Bell, who shared the joys and the dangers of the explorations, and who loves the "edge of the tropics" as does her distinguished husband and their children and grandchildren.

It is a book for the family audience. The outdoor-loving author went at it reluctantly, when he wanted to be in his gardens, touching his trees and remembering the far places whence he brought the seeds. In his enforced concentration, he listens to the wind in the palms, and then sounds from memory come into the record, bird songs, marimba bands, flutes, Balinese mouth-harps, howler monkeys calling, screams of tigers—a magnificent overture to a great recital.

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Dr. Fairchild and his associates, for the government, have been acclimatized in experimental gardens for distribution, but samples of them grow round his door, each one with its interesting history. Not only plants, but also distinguished people, and children who love story-telling, gather round.

The style of the book is conversational, with many human-interest subjects treated as chapter-essays. This makes easy reading although none the less rich in plant study and kindly philosophy.

The purpose of the book is to show "a fascinating world of living things" and with this "picture of a family and a garden and a house of this epoch bring pleasure to others."

The home grounds of The Kampong, as pictured by Dr. Fairchild, should serve as a great incentive to visit the Fairchild Tropical Garden, which is open to the public (and which should not be confused with the home grounds).

The illustrations are fine photographs of Dr. Fairchild's own taking. It occurs to this reviewer that the world is better known since World War II, and that veterans will find familiar places and plants in "The World Grows Round My Door."

EVA NOBLE,
Jacksonville, Florida.

The Story of a New Type Of Botanical Garden

THE CORNELL PLANTATIONS: A HISTORY. Ralph S. Hosmer. 209 pages, illustrated, appendix, indexed. Cayuga Press, Ithaca, 1947. Obtainable from the author, 209 Wait Ave., Ithaca. $3.

This is the story of the early beginnings of an arboretum idea, its growth into the Cornell Plantations and a forecast of the prospects of its future expansion across thousands of acres in conjunction with Cornell University. It describes the creation of a botanical garden which becomes an element in unifying into one organic whole all of the interests of the land which are represented by the outdoor laboratories and displays of the natural sciences taught by the University and

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An interpretive foreword is contributed by Dr. Liberty Hyde Bailey, Chairman of the Plantations Committee on Policy and Management, and an extensive appendix quotes abstracts from significant reports on policies, planning, organization and financing.

This unique undertaking includes not only botanical collections with displays of woody plants in naturalistic settings for their systematic observation, but also farming operations, sanctuaries of wild life, and even recreation facilities, all integrated into the hills, meadows, woods, lakes and chasms of the scenic Finger Lakes region. It is a project set up "by friends of things that grow" and will become a function of the University in developing forms of plants and animals of wider service to man.

The portions of the book dealing with the preservation and development of the cliff-walled gorges with their foaming waterfalls will be of historical interest to all Cornellians, but its principal value is as a clear explanation of the significance of a new enterprise which is appealing to all lovers of Nature.

NELSON M. WELLS,
New York State
Department of Public Works

Fruits and Other Cultivated Plants

GENERAL HORTICULTURE. Thomas J. Talbert. 452 pages, illustrated; bibliography, index. Lea & Febiger, Philadelphia, 1946. $4.

This book on general horticulture presents a fairly complete view of the present culture of fruits. A chapter on vegetables and another on ornamentals have been added, giving only a rough view of present practices in those fields. Interesting questions such as whether fruit trees should be grafted or budded are discussed, and detailed information is given on various types of nursery practices with the growing of fruits. The information has been segregated in such a way that one can quickly turn to the part of the book dealing, for example, with insects attacking stone fruits or bush fruits. In one of the last chapters information is even given on tropical and sub-tropical fruits.

The book is profusely illustrated with many good cuts. Two particular features adding to its value are an excellent set of references for each fruit discussed, including books as well as bulletins, circulars, and scientific papers. The second feature is a set of small maps of the United States, indicating regional distribution of growing areas for each fruit discussed.

All in all the student will gain an up-to-the-minute general view of horticulture as practiced in the United States, especially with reference to fruits.

DONALD WYMAN,
Arnold Arboretum.

Succeeding with Cherries

THE CHERRY AND ITS CULTURE. Victor R. Gardner. 140 pages, illustrated, indexed. Orange Judd, New York. 1946. $1.50.

Here is a good book on the cherry and how to succeed with it.

The author reviews the development of the present-day cherry and then proceeds to give detailed information on its culture. It is obvious that the writer is well acquainted with his subject. Chapters are devoted to all the important phases of the work, including site and soil selection, soil management, pruning, insects and disease, spraying and harvesting.

To those who would grow their own cherries at home and to the commercial orchardist, this book is highly recommended.

EDWIN BECKETT,
Superintendent, Middletown Farm.

Tribute to a Noted Career

MERRILLEANA. Elmer Drew Merrill. 393 pages, illustrated. Chronica Botanica Co., Waltham, Mass. 1946. $4.

Under the title of "Merrilleana" the editors of *Chronica Botanica* have brought together a selection of the writings of Dr. E. D. Merrill, from 1907 to 1946, with a portrait and several other photographs and a sprinkling of drawings and maps. This is a fitting and impressive tribute to a leader in American botany, though the implication that his labors are at an end is, I trust, wholly unwarranted.

H. W. RICKETT.

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THE NEW YORK BOTANICAL GARDEN
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Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*_____.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

JOURNAL

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

AUGUST DISPLAYS AT THE GARDEN

Outdoors

A continuation of the summer's displays of ***annual and perennial flowers*** in borders adjacent to the Conservatory; ***waterlilies*** in the Conservatory Court; ***vegetable garden; herb garden; shrubs and trees,*** of which outstanding specimens in flower in late summer are *Stewartia ovata* (*S. pentagyna*) *grandiflora*, *Oxydendrum arboreum*, the sourwood or sorrel-tree of the southern Appalachians, and, later, *Franklinia* (*Gordonia*) *alatamaha*.

Familiar wild flowers of the season will commence to bloom in the ***Flowering Meadow*** at the southern end of the Rock Garden, bringing the countryside to the doors of city dwellers and giving visitors from afar a glimpse of eastern meadows.

Late in the month the border of ***Hardy Asters*** will come into flower.

Conservatory

Permanent displays of palms, tropical ferns, aquatics, jungle plants, economic plants, cacti and other types of succulents, and other plants. Open daily without charge from 10 a.m. to 4:30 p.m.

Museum

Garden Pests: A display of three dozen water colors, depicting more than 75 insect pests of gardens in all of their life phases, with descriptive labels giving directions for their control. These are the original plates by Eva Melady made for "The Gardener's Bug Book" by Cynthia Westcott.

Other Museum displays show mushroom models in naturalistic settings, flower pictures, and various economic products derived from plants. Open daily, 10 to 5.

* * *

The grounds are open daily without charge from 10 a.m. until half an hour after sunset.

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Twining Plants

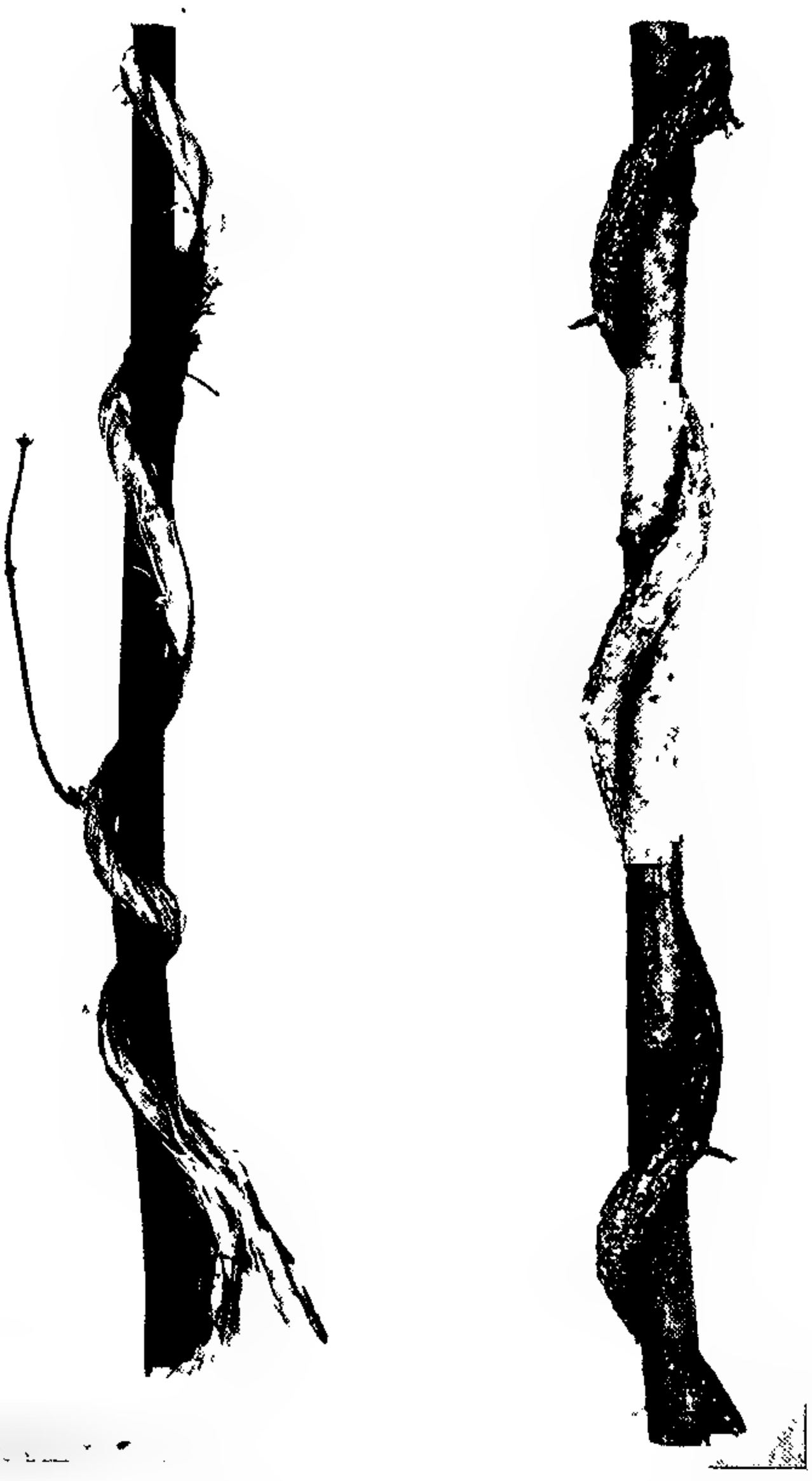
An Inquiry into Clockwise and Counterclockwise Growth North and South of the Equator

By Fred J. Seaver

AMONG the interesting questions frequently asked of members of the staff of the New York Botanical Garden are the following: *Is it true that plants that twine in one direction (clockwise) in the northern hemisphere reverse themselves and twine in the opposite direction (counterclockwise) in the southern hemisphere? And is it true that pig's tails do the same thing?* These questions came over the telephone one morning from a gentleman who was writing a book and was very anxious to get reliable information on the subject.

The latter question, being out of our domain, was promptly referred to the Zoological Garden for answer. To the former question the answer was, "We do not think so, since different plants twine differently in the northern hemisphere." However, since none of our colleagues was able or willing to give a definite answer regarding twining plants, it was decided to refer the question to someone in the southern hemisphere. The following letter was therefore directed to Dr. G. H. Cunningham, a botanist in New Zealand with whom the writer was personally acquainted.

> "I am submitting to you a question which may sound very foolish, but it is one that is frequently presented to us. Do twining plants twine in a different way in the southern hemisphere than in the northern hemisphere? To illustrate, the common lima bean, so far as I have observed, and all leguminous plants, twine counterclockwise, or as Darwin puts it, against the sun, in this part of the world. Do they do the same with you? So far as I am able to judge from herbarium material, they do.
>
> "In looking over Darwin's work, I find that he recorded a species of *Mikania* as twining one way in the northern hemisphere, while another species of the same genus did just the opposite in the southern hemisphere.



REVERSE TWINING IN TWO PLANTS OF THE NORTHERN HEMISPHERE

Left, Lonicera, *a clockwise twiner. Right,* Celastrus, *a counterclockwise twiner. Which one of these is called dextrorse and which one sinistrorse depends upon the view one takes, for the definitions and examples of these terms vary from century to century (even from year to year) and also from authority to authority in the present era.*

Perhaps, this is where the idea originated. This was, however, an exception rather than the rule.

"Any information you give me on this subject will be greatly appreciated.'"

The following answer came from H. H. Allan, Director of the Department of Scientific and Industrial Research, Botany Division, Plant Research Bureau, Wellington, New Zealand.

"Dr. Cunningham has referred your enquiry of August 10 to me for reply. We have twining plants in the genera *Muehlenbeckia* and *Parsonsia*. In *Muehlenbeckia* different individuals of the same species twine sometimes sinistrorsely, sometimes dextrorsely. Moreover, an individual may commence by one method and change over to the other, but most usually the plants *commence* as sinistrorse climbers. In *Parsonsia* the climbing is always sinistrorse.

"Northern hemisphere species climb in New Zealand just as they do in their homeland; I have watched various species of beans over a number of years, and have not found an exception.

"Muehlenbeckia is mentioned by Schenck (Beiträge zur Anatomie der Lianen) as one of the exceptional cases."

Darwin states ("The Movement and Habits of Climbing Plants," p. 33. 1882): "I have seen no instance of two species of the same genus twining in opposite directions, and such cases must be rare; but Fritz Müller states (Journal of the Linn. Soc. (Bot.) 9: 344. 1867) that although *Mikania scandens* twines, as I have described, from left to right, another species in South Brazil twines in an opposite direction."

This is the only statement the writer has been able to find in print even suggesting that the twining habit of a species in the northern hemisphere is reversed in the southern hemisphere, but this involved two different species and even this was regarded by Darwin as very unusual.

While the various species in a given genus usually twine in the same direction, as observed by Darwin, there are some notable exceptions. In one tropical genus, *Dioscorea*, a part of the genus twines to the left and a part to the right. This character is so constant that it is used as a basis for the separation of the species into two sections. (See Annals of the Royal Botanic Garden, Calcutta 14[1]: 5. 1936.)

While a large percentage of the twiners here in the north twine counterclockwise, there are some notable exceptions. So far as observed, the honeysuckles (*Lonicera*) twine clockwise. Also *Wisteria* twines the same way. Others could be added but these will serve to illustrate the point in question.

While the idea that plants that twine in one direction in the northern hemisphere reverse themselves and twine in the other direction in the southern hemisphere is quite prevalent among non-professionals and even some botanists, there is apparently no foundation for this belief. It seems to be a tradition based on a misunderstanding of some of Darwin's statements.

Indestructible Begonias

By Genevieve A. K

MY garden is about twenty years old. It is a walled garden filled flower beds, edged with boxwood. The old wall is covered vines and a large maple tree planted more than fifty years ago ample shade.

The flower beds are dappled in sun and shade and were plante spring and fall bloom. In early spring, they were filled with three s of hyacinths which were followed by small-flowered bedding beg *B. semperflorens.* These plants remained until frost.

Each year the same succession of planting was repeated until the cc of World War II, which stopped the importation of bulbs from Ho and caused the labor shortage which forced drastic changes. So the f beds were planted with grass and on the whole, the garden looked and green and very charming in its quiet restfulness, reminiscent o old southern gardens.

Four years went by; every week during the growing season the

Two of the begonia plants, seeds of which survived four winters out-of-doors i Jersey, then sprouted through the grass which had grown over them.

mower went over the grass in these beds. Then, one day late last fall, the sharp, keen eyes of my grandchild spied blossoms along the edge of the grass inside the box-edged beds. These proved to be seedling plants of *Begonia semperflorens,* which must have sprung from seeds which had lain in the soil for at least four years. The box hedge is eighteen inches high, the situation shady and cool, and the soil clay and leafmold at the roots of the box bushes.

We lifted the little plants, potted them up—57 of them—and carried them over to the greenhouse. By the end of April, some of them were 8 inches tall and in good bloom, one-quarter of them red, three-quarters pink.

The plants used in these beds originally were pink and red mixed. So far as I can tell, all of them conform to the original type planted.

New Pest Controls For The Rose Garden

Presented on Rose-Growers' Day, June 11, 1947, At the New York Botanical Garden

By P. P. Pirone

AN essential but unpleasant phase of successful rose culture is the control of insect pests and fungus diseases. Without a sound spraying program, it is virtually impossible to grow good roses. The healthy, beautiful roses you inspected this morning are the result of a carefully planned and executed pest control program.

It so happens that more insect pests and fungus diseases have been reported on roses than on any other ornamental plant. To make matters even more confusing to the rose grower, there are almost as many proprietary sprays and dusts on the market as there are pests. It is no wonder then, that beginners are sometimes confused as to what material they should use. In the few minutes allotted to me, then, I shall try to mention the more important insect pests and fungus diseases on outdoor roses and bring you up to date on the best spraying or dusting materials.

Insects and Related Pests

Because most insect pests and related organisms can be easily seen and readily controlled, I'll discuss the principal ones first.

Among the insects, aphids or plant lice of several species are perhaps most common. These are soft-bodied, are about one-eighth of an inch

long, and may be pink, green, or black. They usually cluster alo tips of tender growing shoots or on the lower leaf surfaces, whe suck out plant juices. The use of any of several contact insecticides as nicotine sulfate, on a warm day will readily control aphids.

The two-spotted spider mite, although primarily a pest of gree roses, frequently becomes abundant and injurious on outdoor roses eight-legged pest is small—about one-sixty-fourth of an inch long may occur in large numbers. On a single rose leaf, for example, may be as many as 500 to 1,000 of the eggs, and the young and stages. Mites are not so readily controlled as aphids, but their popu can be greatly reduced by applying a mixture of rotenone and sulfur ten days. Such a mixture should contain one percent rotenone a percent finely ground sulfur.

Azobenzene dusts and sprays have proved to be remarkably effect controlling mites on greenhouse roses, but their value on outdoor has not yet been fully determined. If mites become a serious pest or roses, you might want to try the azobenzenes or the hexaethyl phosphate sprays.

Several important leaf-chewing insects also attack roses. Among are the worm or larval stages of several species of sawflies, also Jap beetles, the rose leaf beetle, and the rose chafer. These pests c controlled with DDT sprays or dusts.

Fungus Diseases on Roses

The second group of organisms that take much of the pleasure rose growing are the fungi. These, as we all know, are microscopic which contain no green coloring matter, or chlorophyll, and becaus lack chlorophyll they cannot grow independently. Hence they must d on other plants on which they live—such as roses—for their food.

Control of fungus diseases is more difficult, primarily becaus gardener can't see what he is trying to control until infection is w vanced. By the time symptoms are visible, it is often too late to complete control. Hence, the rose grower must anticipate fungus tions and must apply a protective coating of fungicide before the have an opportunity to penetrate the leaves.

The two most prevalent foliage diseases of rose are mildew and spot. Mildew is familiar to anyone growing ramblers, since it is always present on this type. It forms a white powdery growth on leaves and stems, often producing distortion or dwarfing of infected

Weekly applications of a spray or dust containing sulfur will mildew in check. You may start such applications even after milde pears and still achieve good control.

Probably the most destructive disease on hybrid teas and hybri petuals is blackspot. The name adequately describes the disease b

of the large black spots with feathery margins that occur on the leaves. This fungus may cause all the leaves on a plant to drop prematurely in seasons of more than average rainfall. To control blackspot successfully during such periods, you must faithfully apply a fungicide at weekly or ten-day intervals throughout the season.

There are so many fungicides available today for blackspot control that one hardly knows where to start. Certainly, sulfur compounds, mixtures of copper and sulfur, and some copper compounds still have a place.

More recently many rose growers have switched to such materials as Fermate and Phygon, which have certain advantages over the older sulfur and copper mixtures.

Fermate, for example, is safer to use. Copper-containing fungicides will injure rose foliage if wet, cool periods follow their use. Sulfur compounds, on the other hand, will damage leaves and flowers if used during periods of high temperatures.

A Fermate spray (one ounce in 4 gallons of water) or a 10 percent dust (one part Fermate in 9 parts of talc) will control blackspot. If mildew and mites are also present, it will be necessary to add sulfur to this mixture.

Recent tests show that the best combination to use both early and late in the season is a Fermate-sulfur mixture; that is, 2 level teaspoonfuls of Fermate and 2 tablespoonfuls of wettable sulfur in a gallon of water. During the summer months when the temperatures are high and there is danger of burning, the sulfur should be left out of this mixture. The use of Fermate alone in water, or one part of Fermate and 9 of talc as a dust, is recommended for the summer period. If Fermate is unavailable, the material known as Zerlate might well be substituted.

Of even more recent introduction, and consequently not as thoroughly tested as Fermate, is Phygon. This new substance is a powerful fungicide with a chemical formula similar to that of vitamin K. Applied as a dust (1 part Phygon and 99 parts talc) once a week during the growing season, it has given good control of blackspot. It may also be used as a spray at the rate of ½ ounce for each 3 gallons of water. Phygon can be combined with calcium arsenate to control most chewing insects.

The average rose grower is interested in an all-purpose dust or spray—one that will control insect pests and fungus parasites at one blow. Although this is not yet possible, there are a number of ready-mixed dusts and sprays that will control mildew and blackspot and most chewing and some sucking insects.

The ingredients for preparing three gallons of a combination spray are:

Spreader (Dreft)	1	teaspoonful
Fermate	3	tablespoonfuls
DDT (50% wettable)	1½	tablespoonfuls
Wettable sulfur	1½	tablespoonfuls

This is made up as follows:

First dissolve the Dreft in the 3 gallons of water. Draw off about a p of this mixture into a quart jar, add the Fermate, DDT, and sulfur, shake vigorously until all the powders are thoroughly wetted. Then p this mixture back into the 3 gallons of water and spreader combinat and the spray is ready for use.

There are, of course, many other insects, fungi, and bacteria that att roses. I have only mentioned the more important ones.

Four Rules to Observe

In closing may I stress four cardinal principles that should govern successful pest control program.

1. ***Timeliness***—The spray or dust must be on the plants before start of rainy periods in order to act as a protective barrier against fun parasites.

2. ***Thoroughness***—All parts that are subject to attack, especially under sides of the leaves, must be thoroughly covered with the fungic or insecticide.

3. ***Good equipment*** -The right kind of spray tank or dust gun must available –and this does not mean a watering can or a loosely woven t

4. ***Proper material***—The type of fungus parasite or insect pest m be known before the correct fungicide or insecticide can be applied.

I am confident that if these rules are followed, you will enjoy p free roses in your garden.

Questions Asked at the Conclusion of Dr. Pirone's Talk

1. *Is the spittle bug a serious pest?*

   The spittle bug is quite prevalent at present. The frothy substance is prod by a species of insect somewhat similar to a leafhopper, living inside it. The i does little harm but can be controlled by a dust containing 1% rotenone.

2. *Is DDT harmful to roses?*

   If used in proper dilution and according to directions, DDT is not harmfu roses, but its use is occasionally followed by an increase in the infestation of spider mites. These can be controlled with rotenone-sulfur mixtures, azoben dusts or with hexaethyl tetraphosphate sprays.

3. *Is there any control for stem canker?*

   Stem cankers have been serious this year. They are difficult to control bec the causal fungi are right inside the stems. They can be kept down some by the sprays that are used for fungus diseases of leaves, but drastic pru down to healthy wood seems to be the only cure, and this may mean the of the plant.

A Forest Lover in the Caribbee Islands

VII. The Limestone Caribbees

By J. S. Beard

IN the eastern flank of the northernmost end of the Caribbean volcanic arc lie several small islands which differ strongly from those of the volcanic chain proper, being low and flat and composed largely of limestones. To this group belong isolated Sombrero, British Anguilla, half French, half Dutch St. Martin, French St. Bartélemy and British Antigua and Barbuda (not to be confused with Barbados). This description will cover Antigua and Barbuda only, for the writer did not have the fortune to visit the others. Antigua, by the way, is pronounced "Anteega" and Anguilla "Angwilla": in other words, the "u" is omitted in Antigua where it ought to be sounded and pronounced in Anguilla where it ought not to be.

In structure these islands consist of a basement of ancient volcanoes, long since dead, which many ages ago were eroded down, submerged gradually beneath the waves, and coated with thick deposits of limestone. When there began new earth-movements which led to the erection of the younger chain of volcanic piles to the west which we now see, these old islands were tilted over and raised above the sea again. The sequence of

THIS is the last of the series of seven articles written for this Journal by Dr. John S. Beard, entitled "A Forest Lover in the Caribbee Islands." The series, which began more than three years ago, has consisted of the following numbers:

I. On Robinson Crusoe's Isle (Tobago) May 1944.

II. On the Isle of Spice (Grenada) June 1944.

III. On St. Vincent's Soufrière (St. Vincent) August 1944.

IV. The Cloud-Capped Wilderness of Dominica (Dominica) October 1945.

V. The Helen of the West Indies (St. Lucia) October 1946.

VI. Saba to Montserrat (Montserrat, Redonda, Nevis, St. Christoper, St. Eustatius and Saba) April 1947.

VII. The Limestone Caribbees (Antigua and Barbuda) August 1947.

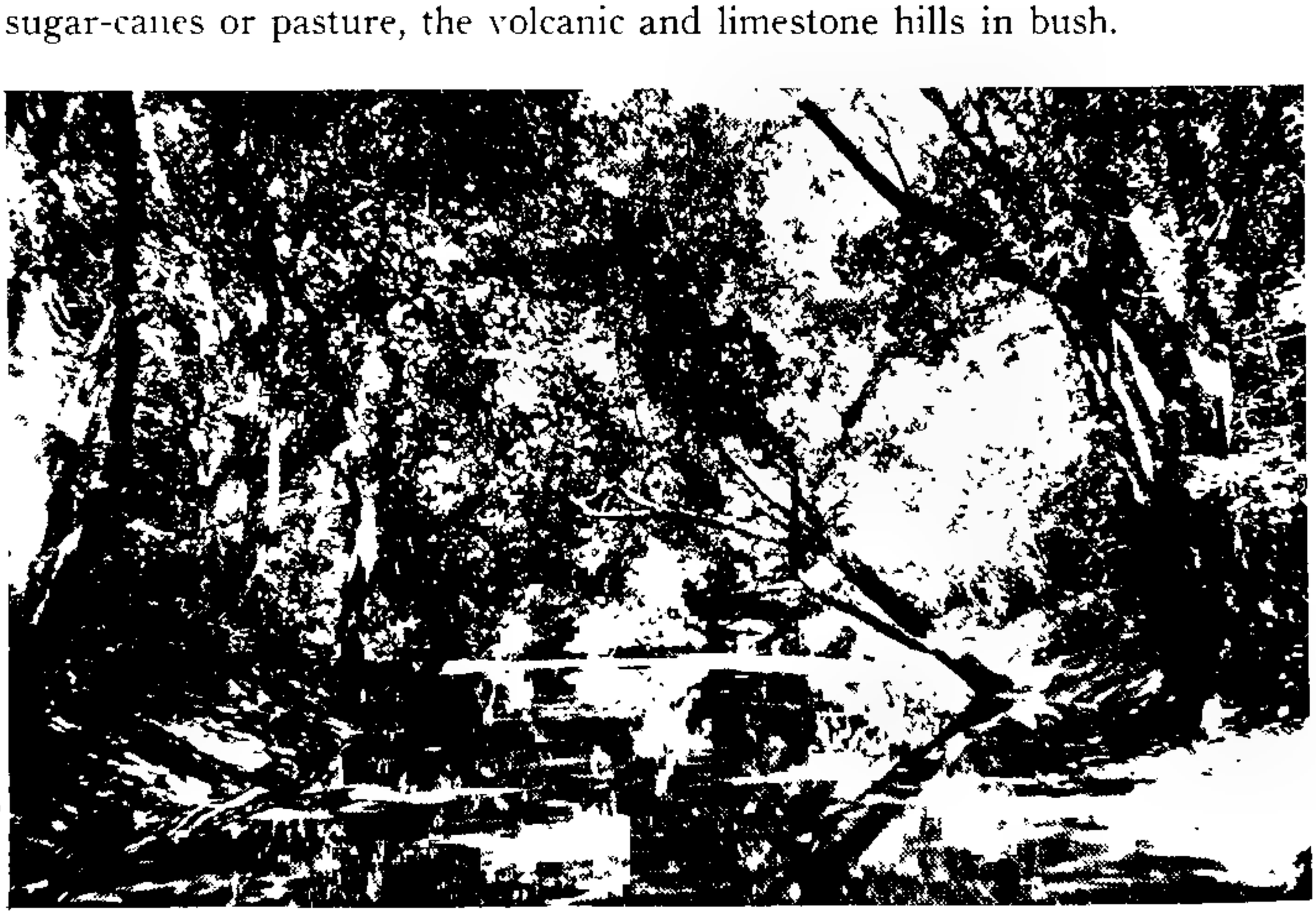
Dr. Beard has recently left the British West Indies, where he has been Conservator of Forests at Trinidad, and is now in Pietermaritzburg, Natal, South Africa, where he is connected with the Natal Tanning Extract Co., Ltd.

rocks in Antigua is a base of old volcanics, overlaid by marine tuffs, followed by marine clays and cherts and then limestones, indicating gradual extinction of the volcanoes and subsidence into deeper and deeper water. All has since been raised again, after tilting by 15 degrees, and considerably reduced by erosion. The volcanics now stand out and form a range of hills across the southwest, up to 1,200 feet in height. The rest of the island is low-lying and consists of a series of small scarp-ridges forming a pattern of hill and dale. Barbuda consists solely of hard Pleistocene limestones lying horizontally, and rising in a series of flat terraces to a central height of 110 feet. These islands are at present rising slowly.

The Vegetation of Antigua

Antigua has an area of 108 square miles. It is a dry island by West Indian standards, the rainfall exceeding 50 inches a year only among the volcanic hills. Long droughts are apt to occur and the island is exposed to high winds from the northeast. A hurricane passes by every few years.

Antigua contains an amount of very workable soil and has been intensively cultivated in sugar-canes since early times, supporting a population which now numbers over 40,000. Nowadays only the more tractable soils are worked in canes, the remainder being utilised for pasture or abandoned to bush. In general, the clay soils of the central part of the island are in sugar-canes or pasture, the volcanic and limestone hills in bush.



Many of the slow, muddy streams in Antigua are bordered by beautiful groves of the whitewood tree, Bucida buceras.

Introduced mesquite and African acacias give Antigua's pastures an aspect foreign to the West Indies.

No vestige of the original forest vegetation now remains on Antigua and it is impossible even to infer its nature very accurately. The central, clay lands probably carried rather an interesting and specialised forest, dry and leafless in the dry season, swampy in the wet. The handsome, combretaceous whitewood tree (*Bucida buceras*) is still very common along streambanks and probably was the dominant tree in the original forest. Several magnificent riverain woods have been preserved by the owners at Collins' and Gaynors' estates, consisting of fine groves of this whitewood, 50 to 60 feet high, with spreading crowns and often multiple stems. A large bromeliad, a species of *Tillandsia,* is very common on them. Other trees occasionally seen include the poisonous manchineel (*Hippomane mancinella*) and white cedar (*Tabebuia pallida*). The undergrowth is formed of the shrub known as gut-apple (*Annona glabra*).

Where lands of this type have been abandoned from cultivation and devoted to pasture, they become covered with a coarse grassland consisting of species of *Paspalum* and *Andropogon* which are comparatively worthless for fodder and are annually burnt to destroy old, coarse growth. Unless given constant attention these pastures readily become covered with a dense growth of "cossy" or thorn bushes. Generally the thorn is kept under control for a time, but its annual eradication eventually becomes too costly and the land is abandoned to become a dense and utterly impenetrable thorn thicket. Once the thorn trees have attained a certain size, they are cut for fuel, a few only being left for shade, and the pasture is re-

The seaswept, indented, eastern coastline of Antigua features giant agaves on an open grassy sward.

created. This is a regular cycle which can be seen everywhere in progress. The commonest "cossy" tree is the mesquite (*Neltuma*—or *Prosopis—juliflora*), introduced from North America. Others include various African species of *Acacia,* such as *A. nilotica* and *A. farnesiana.* A pasture with these umbrella-shaped trees presents a strongly African appearance but it is entirely artificial and consists wholly of introduced species in the overwood, and largely also in the ground layer.

The volcanic hills of the southwest are covered with scrub woodlands or scrub pasture. At one time they were cultivated in sugar right to their summits but erosion soon put a stop to that. The soil now is very thin. Pastures here become colonised first by a thorn thicket of the logwood, (*Haematoxylon campechianum*), introduced from Central America. To this is added later the native white cedar (*Tabebuia pallida* and candlewood, (*Guettarda scabra*), also other less common species. If given a chance a fairly luxuriant woodland is recreated. This has happened so far only

in the catchment of Walling's Reservoir where interference has been prevented. Here there is now a young pole forest of slender trees 50 to 70 feet in height growing up between old branchy mango trees (*Mangifera indica*) which are a relic of former days. Spanish oak (*Inga laurina*) and loblolly (*Pisonia fragrans*) are the dominant trees in this woodland, together with mahoe (*Daphnopsis caribaea*), white cedar (*Tabebuia pallida*), mountain parry (*Linociera caribaea*), locust (*Hymenaea courbaril*), wild star-apple (*Chrysophyllum argenteum*), and prickle (*Fagara martinicensis*). The understory is largely *Erythroxylum ovatum* and *Casearia guianensis*. There can never have been any rain forest among these hills, as the rainfall is too low and intermittent, but there probably used to be a luxuriant, almost evergreen forest of some sort.

The vegetation of the limestone hills of north and east Antigua probably resembled very closely the bushland of Barbuda which is described later. Extensive chopping has taken place so that the whole of it now consists of a secondary scrub composed of native species in the more advanced stages but initially of the introduced Asiatic wild tamarind (*Leucaena glauca*). It is most striking in Antigua the way introduced species like this have become the pioneers in secondary vegetation.[1]

Antigua's low-lying coasts feature many saline ponds and tidal mudflats which carry a stunted mangrove vegetation of the three species, *Rhizophora mangle, Avicennia nitida* and *Laguncularia racemosa*. Bordering these areas on sites not actually inundated but with high water table one finds often groves of poisonous manchineel (*Hippomane*) with some *Annona glabra*. The manchineel trees reach sizes of 30 to 40 feet in height and 4 feet in circumference. Parts of the indented windward coast are bordered by a sea-swept limestone pavement carrying a thin vegetation of grass, sedge, small succulent herbs, gigantic century-plants (*Agave obducta*), prickly-pears (*Opuntia dillenii*) and shrubs of *Conocarpus erectus*.

The Vegetation of Barbuda

Barbuda is an island of 50 square miles, but has only 1,000 inhabitants because of lack of agricultural possibilities. The intermittent rainfall gives only 35 inches a year and the island seems to have been raised so recently above the sea that the hard coral rock has not yet weathered into any depth of soil. In fact, the ground surface consists in large measure of slabs of bare limestone with a little soil in the joints and hollows. Such conditions do not lend themselves to cultivation nor even to the growth of a high forest, and Barbuda's flat landscape is endlessly covered with a dreary bush corresponding to Warming's description of his "Tropical Evergreen Bush-

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1 On very poor rocky land, however, in place of the introduced tamarind, there will be a more familiar-looking thicket consisting largely of *Croton* (*C. flavens*), with *Solanum igneum Lantana involucrata, Melochia tomentosa,* and *Capparis indica.*

Typical bushland on Barbuda. An open glade at the right; at the left, bush with a tall, spiky Plumeria tree and smaller specimens of Bucida and Dodonaea.

land"—"a grey, desolate, useless and scorching bushland between whose thorny, tangled shrubs and low trees one cannot penetrate without the aid of an axe." One can ride for miles along narrow trails through this bush, one's horizon limited always by the low trees immediately at hand. Just occasionally there are glades and savannas where a swift glimpse is had of the game which runs wild over the island a large red deer, wild pig and guinea fowl. In this respect Barbuda is a most interesting island and attracts a number of visitors for hunting, shooting and fishing.

The bushland consists of occasional small trees up to 30 feet high with smaller bushes between. The commonest tree, generally, is the white cedar (*Tabebuia pallida*).[2] On the lower, more swampy ground, the whitewood (*Bucida buceras*) is dominant over the smaller bushes present.[3] Very few of these components are thorny. For the most part, they have small, hard leaves, generally much smaller than are found on the same species elsewhere. The white cedar, for example, normally has leaflets some 5 x 2½ inches, but on Barbuda they never exceed 2 x 1 inch.

Nearing the windward coast the bushland vegetation become progressively more and more stunted and broken up by grassy glades containing

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[2] With this is associated generally the loblollies (*Pisonia fragrans* and *P. subcordata*), boxwood (*Bumelia obovata*), cinnamon (*Canella winterana*), satinwood (*Fagara flava*), and *Dipholis salicifolia.*

[3] These include *Byrsonima lucida, Dodonaea viscosa, Comocladia illicifolia, Plumeria alba, Malpighia linearis,* and several species of *Coccoloba* and *Eugenia.*

huge colonies of the Turk's-head cactus, *Cactus intortus,* an interesting, spherical, spiny succulent with a red protuberance on top which bears the flowers. The windward shore is marked by a line of old sea cliffs now set back up to a quarter mile from the water's edge and separated from it by a belt of sand dunes or a sloping coral platform. The latter bears a low recumbent growth of sea-grape (*Coccolòba uvifera*), *Conocarpus erectus* (here belying its name), and several cacti.[4]

On flatter parts of the island in the south the bushland tends to be broken up by grassy glades, due apparently to waterlogging in the rainy season. Patches of open, treeless savanna are covered with cow grass (*Paspalum bakeri*), a coarse, cutting grass growing in tussocks. The savanna glades are ringed in by whitewood trees of domed form, behind which one enters the bushland. This whole area consists of an irregular jumble of glades

[4] Other plants found include *Suriana maritima, Ernodia littoralis, Erithalis fruticosa* and *Croton balsamiferum,* with the prickly pears, *Opuntia dillenii* and *Nopalea dejecta,* and the spherical cacti, *Cactus intortus* and *Mammillaria nivosa.*

Soilless limestone platform atop the cliffs on the windward coast of Barbuda. The tall cacti are Pilocereus nobilis, the recumbent bushes, Conocarpus erectus. Many Turk's-head cacti (Cactus intortus) dot the ground between.

An open savanna of cow grass on Barbuda, surrounded by Bucida trees.

and leads of savanna, scattered, dome-like whitewoods, patches of saplings, or clumps of trees with cactus and *Coccothrinax* palms.

Definite depressions in the land surface where water collects are filled with the sedge *Fimbristylis ferruginea* and bushes of *Annona glabra.* Depressions deep enough to be below sea level are saline and filled with mangrove.

The vegetation of sand dunes is distinct from that inland and is most richly developed in the southwest in the region of Palmetto Point, where a series of low and irregular dune ridges of coral and shell sand are being actively thrown up. Just above high water mark, the sand is held in place by a small group of seashore plants.[5] Behind these the sand is colonised by the ubiquitous sea-grape (*Coccoloba uvifera*) and several other shrubs and herbaceous plants,[6] including a bromeliad (*Tillandsia ekmani*) and three species of terrestrial orchid.

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[5] These sand-fixers include the vines, *Ipomoea pes-caprae* and *Canavalia maritima* along with the sedge, *Cenchrus pauciflorus,* and the small fleshy herb, *Chamaesyce buxifolia.*

[6] Among the species are *Scaevola plumieri, Chrysobalanus icaco, Lantana involucrata Chamaecrista swartzii,* and *Dodonaea viscosa.*

NOTES AND REVIEWS OF RECENT BOOKS

Forgotten Master Of Morphology

GOETHE'S BOTANY. Agnes Arber. 124 pages, translations. Chronica Botanica Co., Waltham, Mass.; G. E. Stechert & Co., New York, 1946. $2.

The history of science is marked by the eminence of great thinkers whose work it was from time to time to unify the apparent diversity of nature, to relate varied phenomena in one framework of cause and effect. Their concepts have often assumed such authority that they continue to overshadow our explanations long after they may have been shown to be fallacious

Goethe's doctrine of metamorphosis, which taught that all parts of plants are explicable by reference to one underlying form, the leaf, has long played a dominating role in the development of morphology. It started from certain ideas on the physiology of plants, which seem today as fanciful as those of Linnaeus, which they were intended to replace. The important contribution is, however, a philosophical one. The ultimate goal of nature is taken as bisexual reproduction, and toward this each plant strives through its successive differentiations of foliage leaves, bracts, and floral parts. Differentiation is due to differences in the "sap" received by the different parts; this sap is "filtered" and made "finer" by successive nodes and so forms more delicate and beautiful parts (foul-smelling and otherwise repulsive or inconspicuous flowers are conveniently ignored; flowers are all sweetness and light). He invoked, further, four processes to account for successive differences in leaves and floral parts: contraction, expansion, compression, anastomosis. It was "indubitable" to him that the reproductive parts were formed from the spiral vessels; owing to the rarifaction of the sap these parts are greatly contracted and often anastomose (grow together laterally). Bisexual reproduction is referred to as an "immaterial anastomosis." Goethe was convinced that with the aid of these four concepts (material or immaterial) "there is no difficulty in explaining the multifarious forms of flowers and fruits."

As for data—Goethe was familiar with garden flowers at least (roses and pinks, especially teratological forms, are oftenest mentioned), and observed them carefully; using his observations, as he tells us himself, to confirm his theories. If observation does not disclose a root in a bud, "still it is really present there, as in the seed," for theory demands it. It is the more astonishing that the doctrine, bristling with inconsistencies, errors, and fallacies, and frankly derived deductively from philosophical principles rather than from objective study, should continue to exert a preponderant influence over our thinking and our teaching.

In fact, as we are apt to restate it today, it is even more naive than what Goethe had in mind. To him metamorphosis was no mere changing of leaves into other parts. He made it clear that vegetative leaves may equally well be understood as transformed stamens or petals. What is metamorphosed is a fundamental plastic unit, what one might describe as an *idea* of an organ, which appears first as a cotyledon, then as a foliage leaf, later as a bract, finally as the successively formed floral parts. It is called a leaf only for convenience.

The present edition contains an introduction, a translation of Goethe's essay, and the text and translation of a rather irrelevant poem (probably by Tobler) called by Goethe "Die Natur." In the scholarly introduction we learn much of Goethe's training in botany and of the development of his thought. Miss Arber considers in some detail the relation of metamorphosis to the growth of morphology, and clearly points out Goethe's preoccupation with the contemplation of phenomena and the synthesis of forms; yet certain of her remarks seem at variance with this picture. "Goethe's synthetic views [she writes] share the difficulty which besets holistic interpretations in general—that they tend to carry

the enquirer out of the sphere of science." It was Goethe's holistic attitude which led him *into* botany; he never did attain a scientific attitude toward it.

The translation seems adequate, though one may perhaps wonder if the German text should not accompany the translation. A rather free translation, such as this, may possibly lead to misconceptions. However, Miss Arber has done us a great service in thus making us again aware of one of our masters who has been too much forgotten.

H. W. RICKETT.

An Introduction To Gustatory Surprises

FIFTY TROPICAL FRUITS OF NASSAU. Kendal & Julia Morton. 118 pages, illustrated and indexed. Text House, Coral Gables, Fla. 1946. $3.50.

Although this book is based entirely on those fruits which are to be found in Bahaman markets, it will also serve as a guide to the more common fruits found throughout the Caribbean area and, for that matter, most of tropical Latin America. Anyone who has been in native markets there and has been curious about the sometimes strange fruits seen will be glad to have this volume; and for one contemplating a trip into these regions it would be valuable, for the traveler often misses real treats through unfamiliarity with these fine-tasting fruits.

The 55 illustrations are excellent and the treatment is authoritative. Of great importance also, the authors have given brief but clear directions for the preparation and use of these fruits. For example, their paragraph on the many methods of serving so common a fruit as the avocado will be an eye-opener to those who think of it only as an ingredient in salads.

Because of better and more rapid shipping facilities, many of these fruits are being (or could be) brought into northern markets, but do not find ready sale simply because most housewives have no knowledge of their preparation. To those of us who know these tropical fruits from personal experience, this excellent book brings nostalgia and memories of many pleasant meals.

W. H. CAMP.

Industrial Terms With Ample Cross-Indexing

CONCISE CHEMICAL AND TECHNICAL DICTIONARY. H. Bennett. 1055 pages. Chemical Publishing Co., Brooklyn, 1947. $10.

This dictionary, as is indicated in its title, includes definitions of both chemical and technical terms. It has the usual faults and virtues of such an undertaking. That is, while it is not complete from either point of view, it serves as a relatively satisfactory and very concise reference volume. In general, from the organic chemist's point of view, it is most useful for its descriptions of alloys, technical processes, trade names, and other terms which it might be time-consuming to search for elsewhere. Another very useful feature is the inclusion of physical constants of many organic compounds. However, the book has some glaring omissions: It fails to indicate that certain terms are used as class names, and simply defines structurally the simplest member of the group. This is done, for example, in the case of "hydantoin" and "hydantoic acid." Certain important terms which in their simplest form indicate a whole class of compounds, are omitted entirely: for example, "diketopiperazine," "oxazolone," "azlactone." In at least one instance where a biological term is defined ("intussuseption"), the common medical meaning is omitted. The dictionary is most satisfactory for its extensive coverage of industrial terms, less so for its organic and biochemical definitions. The cross-indexing is excellent throughout.

MARJORIE ANCHEL.

Brother León's Monumental Work

FLORA DE CUBA. Hermano León (Joseph S Sauget y Barbier, D.Sc.), Vol. 1, Gimnospermas, Monocotiledoneas. Contribuciones Ocasionales del Museo de Historia Natural del Colegio de la Salle, Número 8. 441 pages, illustrated, indexed. Cultural, S. A., 525 Obispo St. Havana, Cuba. January 1947. $7.

For many years the botanical world has been eagerly awaiting an up-to-date Flora of Cuba. The late Dr. N. L. Britton and Mr. Percy Wilson had such a Flora in preparation, but both died before it could be brought to completion. Brother León a lifelong friend and companion of the two, has now published the first volume of his monumental work.

To say that this book fills an urgent need, and fills it most satisfactorily, is putting it mildly. The advent of León's Flora will be acclaimed wherever any work is attempted on Cuban or other West Indian plants.

This first volume, extending from the cycads to the orchids, is splendidly organized and beautifully assembled. There is a fascinating historical sketch of botanical exploration and botanical writing in Cuba from the time of Swartz (1535) to Marie-Victorin (1944). A glossary, index to authors of genera and binomials, and explanation of abbreviations employed are included, as well as a very splendidly written summary of Cuban phytogeography together with topographic, phytogeographic, and ecologic maps of the island.

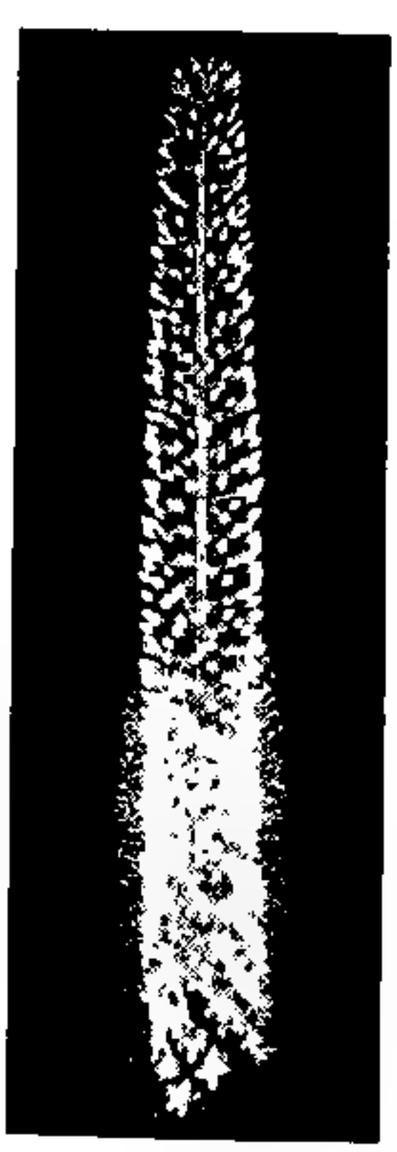
In the taxonomic section 1,303 species are treated in 14 orders, 36 families, and 290 genera. All groups and entities are briefly but adequately described, and common names, synonyms, and both Cuban and extra-limital ranges are given. Several of the larger and more complex families were contributed by world-renowned specialists. Excellent keys are provided to the orders, families, genera, and (in most cases) species treated. There are a bibliography and complete indices to the scientific and common names. Among the most valuable features of the book are the 158 splendid illustrations, mostly adapted from original photographs by the author. Seventeen new species and new names are proposed.

H. N. MOLDENKE.

Vacation Jaunts

LET'S VISIT OUR NATIONAL PARKS. Byron Steel. 224 pages. Robert M. McBride & Co., New York. 1947. $2.50.

Routes, accommodations, sports and other recreational facilities, and special sights, with historical notes and descriptions of national parks of the United States. Thirty-four separate trips are



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YOUR WESTERN NATIONAL PARKS. Dorr Yeager. 264 pages, illustrated, indexed. Dodd, Mead, New York. 1947. $3.50.

A descriptive guide to more than forty national parks and monuments, followed by a useful bibliography of other descriptive and historical material and a list of national park service areas, in addition to some practical units on traveling.

For the Youngest Readers

ANYWHERE IN THE WORLD. Irma E. Webber. 64 pages, illustrated. William R. Scott, Inc., New York. 1947. $1.50.

Poster-like pictures, some for coloring with crayons, accompanying the very simplest words about plants and animals and how they live together in different parts of the world.

FLOWER FABLES. Zillah Whited. 23 pages, illustrated. Flower Books, Inc., New York. 1946. $1.

A fairy tale picture book for very little folk.

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The Same Trees, Same Good Book For Learning Their Identity

HANDBOOK OF THE TREES OF THE NORTHERN STATES AND CANADA. Romeyn B. Hough. 457 pages, illustrated, indexed. Macmillan, New York, 1947. $5.50.

This book, with its 479 carefully made and faithfully reproduced photographs, is a page for page, line for line reprint of the book of the same title copyrighted and first published by the author in 1907. It must be well known to many people, having gone through at least five printings before the present publisher brought out the 1947 book.

The passing of forty years has in no way put the book out of date. The same trees grow in the northern states and a new generation of people is constantly growing up to the point of being interested in trees. It is hard to imagine better photographs to portray the leaves, twigs, and fruits with a scale always indicated. Other pictures show the tree habit and bark characteristics. Photomicrographs of the wood of some species are included and there is a map of the distribution of native trees. Keys to the families appear in the front of the book and in the last pages there are keys to the genera and species. Here an occasional species occurs that is not represented in the picture section.

There is little question of completeness, though it is curious finding *Quercus borealis*, *Q. ilicifolia*, and *Q. prinoides* mentioned only in the key, while *Cornus alternifolia*, *Rhus hirta*, *R. copallina*, and *R. vernix* have pictures, as does *Rhododendron maximum* and some others commonly thought of as shrubs.

The publisher has done an excellent job typographically and in reproducing the cuts.

JOHN A. SMALL,
New Jersey College for Women.

The Ubiquitous Insecticide

DDT AND THE INSECT PROBLEM. James C. Leary, William I. Fishbein, and Lawrence C. Salter. 164 pages, illustrated, indexed. McGraw-Hill Book Co., New York. 1946. $2.50.

The use of DDT in agriculture, where, the author says, it is still in test, and its value in controlling insect pests affecting trees of all kinds and other ornamental

plants are covered in this book. Reports are also given on other uses of DDT, particularly in the interest of human health.

DDT: KILLER OF KILLERS. O. T. Zimmerman & Irvin Lavine. 170 pages, illustrated, indexed. Industrial Research Service, Dover, New Hampshire. 1946. $2.75.

A popularly written report of the history, composition, uses, dangers, and future of the chief insecticide that was born with World War II. The appendix gives instructions for the use of DDT in control of the common insect pests that affect man and animals.

Conservation and Land Use

THE LAND AND WILDLIFE. Edward H. Graham. 210 pages, illustrated, indexed, bibliography. Oxford University Press, New York. 1947. $4.

A beautifully illustrated book, attractively printed on the finest paper that has been seen for a number of years. The appearance of the book gives evidence of its content, which outlines, according to the publisher, "The management of wildlife by means of land use"—but which might be stated also as the management of land in the interests of wild life. Every type of land is included, from the farm pond to the forest. Some historical chapters introduce the subject effectively.

ELEMENTS OF SOIL CONSERVATION. Hugh Hammond Bennett. 385 pages, illustrated, indexed. McGraw-Hill Book Co., New York. 1947. $3.20.

The Chief of the Soil Conservation Service of the United States Department of Agriculture shows effectively the tragic results of erosion and, with the help of drawings and photographs, practical methods for preventing further waste of soil.

The outline of topics at the heading of each chapter is an attractive and useful feature of the book, as are the questions and references at the end.

THE FOUR FORESTS AND THE FUTURE OF THE SOUTH. I. F. Eldredge. 65 pages, illustrated. Charles Lathrop Pack Forestry Foundation, 1214 Sixteenth St., N.W., Washington, D. C. 1947.

An appeal for greater use of the forests of the southern states—the area of which is 50 percent greater than that of agricultural land—for the improvement of the economic situation in the South. The four regions described are, from west to east, the Trans-Mississippi Forest, Mississippi River Bottom Land, Up-country Forest, and, chiefly in southern Georgia and Florida, the Naval Stores Belt.

Concerned With Baking

ENZYMES AND THEIR ROLE IN WHEAT TECHNOLOGY. J. A. Anderson. 348 pages, indexed. Interscience Publishers, Inc., New York. 1946. $4.50.

This is an excellent and useful text, not only for persons directly concerned in the baking industry, but for persons seeking complete and authoritative reviews on some of the most frequently encountered enzyme systems. The academic treatment of the various enzymes is particularly good, while the discussion of the practical applications suffers somewhat, perhaps more from a lack of experimental investigations than from editorial treatment of information that is available.

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Ferns and More Ferns

A KEY TO THE FERNS OF PENNSYLVANIA. Elsie Deane Canan. 106 pages, illustrated by Elizabeth Trent, indexed. The Science Press Printing Co., Lancaster, Pa. 1946. $1.50.

An 18-page key for 59 species of ferns, followed by a delicately drawn, full-page illustration of each. A supplementary key is provided for identification of ferns when only sterile fronds are present.

FERNS. William Alphonso Murrill. 94 pages, illustrated, indexed. W. A. Murrill, Gainesville, Fla. 1947. $2 40

An old-fashioned story of a boy named Edward, followed by a key and descriptive guide, based, the author says in his preface, on more than 60 years of intimate association with ferns.

Wood Flowers Made by Parasite Placed on Exhibit in Museum

ROOTS of certain parasitic plants, chiefly in the Mistletoe family, when they penetrate the branches of their host trees sometimes cause deformations which appear like flowers carved from wood. Two specimens of these wood flowers have recently been placed in the Museum of the New York Botanical Garden, in one of the new cases on the basement floor.

A gift from Clarence McK. Lewis, who received them from Mrs. Margaret Lewis of Guatemala City, the wood flowers came from trees in Guatemala, the only place from which these curious growths have been reported. Generally they occur in the region of the Volcán de Fuego. They are very briefly described in Ulises Rojas' book, "Elementos de Botánica General" (published in Guatemala, 1926-28), where illustrations are given of several wood flowers, caused particularly by *Phoradendron velutinum,* which lives on oaks, and *Struthanthus densiflorus,* which lives on citrus trees. Other mistletoe-like species mentioned are *S. venetus* (which the natives call TEAPIZMICTIAMIQUAUHITL), which lives on the anona; *Psittacanthus schiedianus,* a parasite on willow; *P. calyculatus,* on avocado, oak, acacia, and other plants "and for this reason . . . called avocado-graft . . . also evil eye, oak-gum, etc.;" *Psittacanthus* (or *Loranthus*) *americanus* "called MATAPALO (wood-slayer)"; and *Phoradendron tamaulipense,* "SECAPALO (wood-dryer), which inhabits willow, poplar, mimosa, etc."

These plants all belong to the Loranthaceae, or Mistletoe family, but it is not stated whether these others cause decorative deformations. *Helosis guianensis* and *H. mexicana* of the closely related Balanoforaceae have also been reported as causing the growth of wood flowers.

"Wood flowers" sculptured by the roots of a species of mistletoe growing on a tree in Guatemala.

"The wood flowers are obtained by tearing a loranth out by the roots from the plant which is giving it hospitality," says Rojas. They may also be taken from the tree after the parasitizing mistletoe has died. They are formed, in the first place, as the roots of the parasite penetrate the branch of the host. An abnormal growth develops around them; cells reproduce at such a rate that the excrescences are in fantastic forms when the plant finally dies and the roots of the parasite weather away.*

These loranthaceous plants have exceedingly viscous fruits, which are carried by birds from tree to tree. In Guatemala several of the plants are called LIGA or birdlime, and the fruits are used by children to ensnare birds.

In the English periodical, *The Gardeners' Chronicle*, for Nov. 4, 1871, page 1425, there is an illustration of a wood flower accompanying a short note in a report from the Scientific Committee of the Royal Horticultural Society, saying:

"Mr. Murray also showed a branch of a tree growing in Guatemala, and curiously deformed, apparently from the growth of some Loranth. A similar form, imported by Mr. Skinner, was figured in our columns many years since."

* From a letter from Mrs. Margaret Lewis, quoting Don Mariano Pacheco, whom she asked about the origin of the wood flowers.

Notes, News, and Comment

Graduation Exercises. Certificates were awarded to four students in the two-year course at the New York Botanical Garden at graduation exercises which took place June 26 at 8 p.m. in the Members' Room. Carl F. Wedell, head of the School of Horticulture at the Long Island Agricultural and Technical Institute at Farmingdale, was the speaker at this program. Graduates included Hamilton W. Dunn, now at Buena Park, Calif., Dewhirst W. Wade, a tree service man at Pleasantville, N. Y., and Harry E. Ahles, a gardener at the New York Botanical Garden, who completed the Two-Year Science Course for Gardeners, and Alice V. Conklin of the Bronx, who received a certificate for the Two-Year Course in Practical Gardening.

A social hour followed the ceremonies and talk. Mr. Wedell's talk was built around the principles which a young gardener should follow in starting his life work.

Greenland Expedition. Accompanying Donald B. MacMillan in the schooner *Bowdoin*, Rutherford Platt is now on his way to Greenland on a three months' trip of 4,000 miles each way. Leaving New York early in June, Mr. Platt expected to join the party, which consists of about ten persons with varying interests in the natural sciences, at Sidney, Cape Breton Island, at the northern end of Nova Scotia around June 20. The route from there was to be up the coast of Labrador to Baffin Land, across Davis Strait to Greenland, then up the west coast of Greenland as far as ice would permit. It was hoped to reach Etah, the farthest north navigable point, about Aug. 1 and to have about three weeks of exploring there before the ice begins to close in for the winter. For plant collecting, Mr. Platt, who is a member of the Garden's Corporation and the author of "This Green World," will be working under the Garden's auspices. He is to be assisted by Arthur J. Boucot, a geology student at Harvard.

Chrysanthemum Show. October 24, 25 and 26, have been set for the Fourth Annual Chrysanthemum Show at New York Botanical Garden, to be given this year in co-operation with the National Chrysanthemum Society, an outgrowth of the three-year-old Eastern States society. For the first time, the show will include a children's exhibit with

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competitive entries, which will be held on Saturday in the basement of the Museum Building. A show schedule, announcing the classes of flowers to be entered for competition or decoration on the main floor, is obtainable from Mrs. H. E. Kincaid, Show Chairman, 416 N. Barry Avenue, Mamaroneck, N. Y.

Williamsburg. The Second Annual Symposium on the Gardens and Flowers of the Eighteenth Century will take place at Colonial Williamsburg the latter part of January 1948. Programs of lectures, garden tours, and other events are being planned for Jan. 19 to 23 and Jan. 26 to 30, with a duplicate program. Registrations are limited to 150 for each week.

Training. Cornelia Tyler, a student at Pratt Library School, worked at the Garden for two weeks during May, for practical training.

Award. Dr. Cynthia Westcott, who was assisting in the Plant Pathology department at the Garden during the interim between Dr. Dodge's retirement and Dr. Pirone's arrival, has been awarded a certificate for her recent volume, "The Gardener's Bug Book" in recognition of distinguished service in compiling and publishing material of extraordinary value in the advancement of gardening. The award was made May 5 by the National Council of State Garden Clubs, Inc.

Groups. The following Garden Clubs, during recent weeks, toured the grounds, had lunch either in the Members' Room or outdoors, and saw "The Gift of Green": Fairfield (Conn.) Garden Club, Pennsylvania Railroad Women's Auxiliary, Garden Group of the Darien (Conn.) Community Association and the White Plains Garden Club.

Many students, including groups from Emerson High School, Union City, N. J.; Teachers College at Columbia; Myrtle Avenue Junior High School, Irvington, N. J.; Academy of Our Lady of Good Counsel, White Plains, and P. S. 35 and P. S. 81 of New York City visited the Conservatory, Flower Borders, Hemlock Forest, Rose Garden and Rock Garden and saw "The Gift of Green" during May and June.

Veterans. Guided by volunteers recruited through the Garden's Manhattan office, groups of patients from the Veterans' Hospital in the Bronx are being taken on tours of the New York Botanical Garden every other Friday during the summer months. Picnic lunches and transportation are furnished for the men by the American Women's Voluntary Services. Martha Strong Turner and Mrs. Albert Francke, Jr., are the two leading volunteers.

Members' Day. The concluding program of the season took place June 4, when Mrs. Mortimer J. Fox spoke on "Some Native American Herbs and Vegetables." Mrs. Fox is the author of "Gardening for Good Eating" and other books, and a member of the New York Botanical Garden and of the Advisory Council. The programs will be resumed in the fall.

Prizes. Two prizes of $200 each are offered by A. Cressy Morrison for the most acceptable papers in the field of natural science submitted before October 15, 1947, by a member of the New York Academy of Science. Papers must be the results of original research not previously published.

Minnesota. A memorial research fellowship in botany, honoring Conway MacMillan, has been established at the University of Minnesota by Charles J. Brand. A. Stanley Holt, a graduate of Rhode Island State College, now working for his doctor's degree in the evolution of oxygen by chloroplasts in the presence of oxidizing agents, is the first recipient of the fellowship. Professor MacMillan was head of the Department of Botany at the University of Minnesota from 1891 until 1906. He was responsible for bringing Dr. Alexander P. Anderson to his department for a year in 1899, and it is said that he was the one who induced Dr. Anderson, as a result of his own research, to continue experiments on the popping of grains. The outcome of this work was the well-known discovery in 1901 at the New York Botanical Garden of a method of exploding starch grains to produce palatable dry cereals from wheat and rice.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

EVENTS OF EARLY AUTUMN AT THE GARDEN

Courses of Study

Classes for gardeners, amateur botanists, nature students, and teachers will open in September at the New York Botanical Garden. The schedule is given below. Complete details are contained in the Educational Program booklet, mailed free upon request. When the fee for a course amounts to ten dollars or more, the student may have it applied to a year's membership in the Garden, with all attendant privileges.

Field Botany

Autumn term. — Seven sessions, Saturday afternoons, 1:30-3 p.m.
Sept. 13-Oct. 25 — Instructor: *G. L. Wittrock* — $5 ($2.50 to teachers)

Nature Study for Teachers

Autumn term. — Fifteen sessions, Wednesday afternoons, 4-6 p.m.
Sept. 17-Jan. 7, 1948 — Instructor: *Dr. E. E. Naylor* — $5 ($2 to teachers)

Two-Year Course in Practical Gardening

Fundamentals of Gardening. — Twelve sessions, Thursday evenings, 8-9 p.m.
Sept. 25-Dec. 18 — Instructor: *T. H. Everett* — $10

Two-Year Science Course for Gardeners

General Botany I. — Twelve sessions, Monday evenings, 8-9 p.m.
Sept. 29-Dec. 15. — Instructor: *Dr. H. W. Rickett* — $10
Systematic Botany. — Twelve sessions, Monday evenings, 9-10 p.m.
Sept. 29-Dec. 15 — Instructor: *Dr. H. N. Moldenke* — $10

Saturday Afternoon Programs

The annual series of free motion pictures and lectures will commence Saturday, Oct. 4, at 3 p.m. A complete schedule of topics will be mailed free upon request. The two opening programs will be:

Oct. 4 ***"Magic in Agriculture"*** **and** ***"Masters of the Soil"***
Two motion pictures with sound

Oct. 11 ***Tulips and Daffodils for a Long Season of Bloom*** — *David Platt*
With a motion picture in color — Vice-President, Max Schling, Seedsmen, Inc.

Members' Day Programs

Plans to present the Garden's activities to a larger group of invited guests through the monthly Members' Day programs are being made by the Garden's Manhattan office. The opening program, which will take place in the Lecture Hall, to be followed by tea and a horticultural exhibit, as usual, in the Members' Room, will be:

Oct. 1 ***Autumn Gardening and How to Do It***
A practical demonstration given indoors on how to handle some urgent tasks.
T. H. Everett
Horticulturist

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JOURNAL

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Roses In Landscaping

By Marian Coffin

***Presented at Rose-Growers' Day at the Garden, June* 11, 1947**

THERE are many ways in which roses can be used in the landscape. First we think of the finely designed, laid out, and well tended rose garden such as you see today in this New York Botanical Garden, giving pleasure to innumerable city dwellers and inspiration to flower lovers with gardens large and small of their own.

The Formal Rose Garden

A rose garden is usually formal in design, connected with the house or at some distance from it, but wherever placed it is important that it be or seem to be an integral part of the surrounding landscape.

The Queen of Flowers, like all royalty, should be hedged about by pomp and circumstance. She must have an adequate setting of greenery to show off her flowers to the greatest advantage, but above all a background is needed to define her court. The background may be a wall of brick or stone on which choice climbers may be grown, or a planting of deciduous shrubs, but best of all (enhancing the varied tints) will be an evergreen background, stiffly clipped to form a dense green wall. Grass panels, center motives, or wide grass paths are equally valuable in the composition in carrying further the setting of greenery.

On the Cover

In the small formal garden of Mr. and Mrs. Clement Wild at Old Lyme, Conn., Miss Coffin has used dwarf box for edgings and yews for accents in a garden of hybrid tea roses.

Water also has a distinct place in such important gardens, be it used in elaborate fountains or a quiet pool reflecting the colors of the flowers and the passing shadows of the day.

Accents of evergreen trees and shrubs may also be employed, and of course dwarf box, ilex, or some other low evergreen is needed to edge the beds.

Such a garden, be it large or small, is a special problem in design and should not be attempted unless it can be not only laid out as a thing of beauty but also maintained in that condition of perfection.

Species and Climbers

But few of us can have such gardens and it is foolish to attempt such a scheme (which is always a problem, and usually an expensive one), without expert help in making the plan and providing for the garden's maintenance.

Besides such splendid layouts there are many other ways of using the flowers as free-growing bushes, as hedges, and as vines or creepers on arbors or fences or lattices.

The species roses are well adapted to the former purposes and the newer as well as many of the older climbers to the latter purpose. We don't use half enough species roses, and I often wonder why. Is it because, when we think of roses, we instinctively think only of the most showy type of flower, grown for display indoors or out? Realizing that they are not for us—for the special requirements of our topography or restricted grounds—we give up the idea of growing roses and by so doing miss much horticultural pleasure.

The bush roses, species, or so-called old-fashioned roses, as well as the grand array of climbers, polyanthas, and floribundas, are all easy to grow, require little attention after being once established in well fertilized good soil, and are charming in bloom. Some of the newer climbers are even as showy as fine exhibition flowers. On the whole, they have fine foliage and best of all seem to fit into informal plantings and naturalistic landscape pictures.

Accents with Roses

For accents in the garden borders or on a terrace or lawn, a bush or two of the old China hybrid "Mme. Plantier," still a favorite, makes a spreading fountain of white bloom; or if a note of yellow is preferred it will be given by the even spreadier *Rosa Hugonis,* or for more upright plants, less ornamental in foliage, "Harrison's Yellow" and "Persian Yellow," both hybrids of *Rosa lutea* from the Orient. The rugosa hybrid "Agnes" is a lovely flower and does well in a border, while the floriferous "Grüss an Teplitz," in rich red, though strictly a tea or hybrid tea, could be used for the same

In Miss Coffin's own garden in Rhode Island, roses hold a prominent place in the scene. Here, "Gardenia" roses are growing on a picket fence.

purpose. A near relation to the Scotch or Burnet rose, *R. spinosissima,* is *R. altaica* from Asia, a lovely plant, medium sized, with lemon white flowers —a gem.

Informal Garden

If you want a real rose garden without too much upkeep or expense, why not try an informally designed one with these types of roses?

Use the larger varieties of the bush or species roses for the boundaries or hedge and the small for growing inside.

If you have space, as they grow tall and spread widely, try the unique hybrids of the old sweetbrier—the Penzance briers which retain the same sweet scent as the parent and whose flowers have a color range from blush pink and fawn to sunset colors of salmon and copper.

For the enclosure it would be interesting to use some of the medium growers, among the so-called old-fashioned roses, say a plant or two of the Moss or Crested Moss for sentiment, and also for sentiment and their especially delightful odor, the Damask rose, brought from the Holy Land in the thirteenth century, the Cabbage rose and the York and Lancaster rose, semi-double white or pink widely splashed with crimson. "Rosa Mundi" is similar and is often called York and Lancaster. All bring back memories of long ago.

Low-growing roses clamber over the stone wall at the end of Miss Coffin's garden. The Brownell roses "F. S. Peck," "Little Compton Creeper," and "Apricot Glow" may be seen here, with "Mermaid" creeping shyly along with the others.

With them can be associated the less vigorous growing *R. Moysii,* with its blood-red flowers and good foliage. Looking for something a little smaller (though still requiring room to expand) you could again use the exquisite *R. Hugonis,* also *R. Ecae* (*R. primula*), a charming and even softer yellow; likewise "Mme. Plantier" and some of the fine *R. rugosa* hybrids like "Blanc Double de Coubert" (blooming all summer) for whites, and for pinks again the *R. rugosa* hybrids, such as "Conrad Meyer."

In the cottage gardens of England used to be one of the most charming plants—"Stawell Perpetual." It has a straggly character, so three or more should be planted together about a foot apart, to allow them to intertwine. It is really an all-summer bloomer. *Rosa altaica* will also find a place, as

will many of the attractive varieties of the Burnet rose, *R. spinosissima,* and one or two of the old China or Bengal roses, beloved of our grandmothers, such as the low-growing and exquisite pink of "Hermosa," or the more salmon tints of "Comtesse du Cayla."

The pompons, polyanthas and floribundas of low bushy habit, long duration of bloom, and far-flung gamut of color range, are invaluable for small beds, borders and edgings, as are the newer floribundas, so popular at the World's Fair.

There is something very appealing in these small plants and even more engaging and innocent in the flowers of the small pompon "Rose de Meaux" or "Cramoisi Supérieur" and "Tiny Fairy Rose" and *R. Roulettii.* These should be placed where they are not overpowered by larger neighbors or in a comfortable and exclusive pocket in the rock garden.

Such an informal grouping of roses can be planned for small areas. If the lower and medium growers are chosen, the upkeep will be little and the bloom for several months will be rewarding.

They may be edged or may spring from a ground cover of some of the dwarfer herbs, such as chives, *Teucrium, Nepeta Mussini,* or old-fashioned pinks.

Climbers

For anyone who owns a wall, a fence, a lattice, an arbor or pergola, or who can build one, the opportunities for enjoying many of our old favorites as well as stunning new introductions is far-reaching. Such a support for climbing roses can be a garden in itself.

Almost every type of flower is represented—single or double, large or small, in many different colors. The difficulty is to limit one's choice it is not necessary always to plant a crimson rambler!

Taste is such an individual thing that it is practically impossible to recommend any special climber or rambler. See these roses yourself when they are in bloom and make up your own mind, not what you would like to grow, as that might be too large an order, but what you can't bear to be without.

On a picket fence bounding my small cottage garden in Rhode Island is a jumble of some of the old favorites that I am especially fond of -the glowing "Paul's Scarlet Climber" between the rich velvety maroon of "Dr. Huey," leading up to the soft creamy yellow of a long stretch of "Gardenia."

Landscape Effects

Marian Cruger Coffin is the author of "Trees and Shrubs for Landscape Effects," a book which was published by Scribner and reviewed in this Journal in April 1940.

Then on some cross fences grow the pinks—"Dr. Van Fleet," such a generous plant, the hybrid "New Dawn," and the shy but lovely "Jacotte"; and on a lattice by the house a fine plant of the single white "Silver Moon," almost as beautiful as the Cherokee rose of the South.

At the end of the garden over a low stone wall is a group of the newer Brownell roses, happy to ramble over a low support—the brilliant watermelon-pink "Frederick S. Peck," the single wild-rose flowers of "Little Compton Creeper," and the more blush peach of "Coral Creeper"—all happy and harmonious together.

Last but loveliest of all is the shy "Mermaid," shy of her perfect single lemon bloom and quite as shy of being seen. She always cowers at the foot of the wall trying to hide from me and her associates—not too hardy, but even if she is frequently winter-killed, it is worth trying her again and again.

On a seven- to eight-foot lattice, the background of a separate little garden, grow the taller yellow and orange tinted Brownell climbers, vigorous, with fine foliage and blooms that are as large and as handsome as any exhibition rose. These are my favorites now but I will probably add to the collection as fine new varieties come along.

Trailers and Low-growing Roses

Why not use some of the low trailers or creepers? They are invaluable as ground covers for steep banks and long slopes—especially the Memorial rose, *R. Wichuraiana* and its varieties, also *R. rugosa repens* and the newer "Carpet of Gold."

For larger slopes and higher banks, the Prairie rose, *R. setigera,* blooms latest of our native species, and *R. rubrifolia,* the stems and leaves flushed with rose, and the white-flowered *Rosa multiflora* will ramp gracefully and make a nice tangle. I always wonder why people try to maintain stiff grass banks; surely they have little beauty and require constant care. Why not cover them with some of the trailing roses mentioned or with some of the bush or species roses in medium sizes?

The smaller bush roses (not ramblers or creepers) are excellent for such banks or slopes and are equally so for the general landscape use of mass plantings, informal hedges, defining the borders of paths or drives and, in fact, for general utility.

This is the way to utilize our own wild roses, *Rosa blanda, R. carolina* and the dwarf *R. nitida,* hardy to the far, far north, with the invaluable Scotch rose, *R. spinosissima,* distinctive in character, and the well known and invaluable *R. rugosa.*

Wild roses are sun and wind lovers; they delight to grow near the sea. The Asiatic *R. rugosa* will withstand a certain amount of salt spray. In fact, with the native bayberry it was the first plant to recover from being buried by sand and salt water in the hurricane of 1938.

Summer flowers take the place of the June display of roses in Miss Coffin's garden. A few lingering "Jacotte" roses may still be seen on the fence.

Effects

One of the loveliest landscape effects I have ever seen was a rough field full of red cedars by the side of a New England river, opposite an old sea captain's house. Originally he must have brought back from his voyages a plant or two of *R. multiflora,* which after many years had escaped cultivation and taken possession of the field. Now in June it is a mass of roses, gleaming white pools of snow between the dark evergreens—a most beautiful picture and a happy accident of nature from which human planters could learn a lesson.

If you too would like to create landscape effects with roses, study the different species and varieties and learn to know the requirements of the individual plant. With this knowledge you will know how to place them so that they will be at home and happy. They will then flourish and give you enduring pleasure.

Composts, Manures and Inorganic Fertilizers

Their Function, Use and Effects on Soils and Plants

I

By Walter Thomas

IN recent years considerable propaganda against inorganic fertilizers has been spread by certain schools who claim to have established that the use of such chemicals "poison" the soil, destroy humus, cause soil erosion, injure the quality of crops, and lower the ability of plants to resist disease, and that animals and human beings consuming products grown on soils receiving such dressings are particularly susceptible to many diseases. All this is very exciting.

The schools that hold these views originated in Europe, and are known by such names as "bio-dynamic," "organic" and "compost" farming and gardening. We shall refer to them collectively as the "humus school." Their faith is firmly rooted in the beneficence of Nature. Consequently, whatever is "natural" is right; chemical fertilizers being "artificial" are, therefore, wrong.

Although their sincerity is not questioned, the humus school is skillful in pointing out experiments that appear to fit their views and in ignoring the evidence unfavorable to them. Nevertheless, in popularizing the value of sound agricultural practices such as the addition of valuable plant and animal residues to soil as compost, the humus school has rendered good service; simultaneously, they have not only confused the issues, but have misled the non-scientist by exaggerations and unsound generalizations.

About the Author

THE education of Dr. Walter Thomas began in Wales, where he was born. During 1906 and '07 he worked at the Wellcome Chemical Research Laboratories in London, spent the following year with the Canadian Department of Agriculture, and went from there directly to Pennsylvania State College, where he has been Professor of Plant Nutrition for the past ten years.

As can be seen by the accompanying article on soils and plant nutrition, Dr. Thomas believes thoroughly in the use of organic materials in the soil, but, as he points out, while the pro-humus views of the ardent protagonists of what he calls the "humus school" are sound, their deductions about the effect of fertilizers are wrong. Dr. Thomas here gives an over-all picture of how and from what sources plants derive their nutrition and of the effect of different types of nutrients in the soil.

The purpose of this article is to clarify the subject in a manner understandable to the layman and at the same time to adopt the scientific attitude of complete detachment. It will not be possible in a short article to give the details of the arguments and evidence pro and con; but the facts can be condensed and summarized and as close an approximation to the truth presented as is possible.

Evolution of the Views on How Plants Derive Their Food

Long before the Christian era philosophers speculated on how plants derived their food. One theory was that all their food was obtained from water and another that they fed upon the decaying animal and vegetable organic matter in the soil. Although experiments made about the middle of the 18th century appeared to give some indications that certain substances like nitrates, potash salts, and phosphates were useful, it was not until one hundred years later that the knowledge gained by plant physiologists about the nutrition of plants was pieced together and integrated into a theory that up to the present has met all the criteria of validity.

The picture presented then (*circa* 1840) was that plants derived most of their food from the air in the form of oxygen and carbon dioxide and the remainder from the soil: water and simple compounds of nitrogen, potassium, phosphorus, calcium, magnesium, sulfur, iron, and other elements, which are built up into the complex substances that finally form the tissues of the plant. Thus was abolished the old mystery that plants could receive their nourishment only from substances similar in nature to themselves. As a result the whole process of plant nutrition could be subjected to scientific investigation, and the new theory, furthermore, showed the way by which the natural resources of the soil could be improved by the addition of suitable substances.

Then followed the classical field experiments in England between 1840 and 1843 which established the fertilizing value of mineral constituents, particularly of certain compounds (salts) containing nitrogen, phosphorus, and potassium. This knowledge led to the birth of the fertilizer industry - a development which made possible the maintenance of modern Europe's population.

Factors Influencing Fertility of the Soil

Plants have been shown by analysis to contain, in addition to carbon, hydrogen, and oxygen, the "mineral" elements nitrogen, phosphorus, potassium, calcium, magnesium, iron, sulfur, chlorine, and other elements absorbed from the original "weathered" rock material. Although the atmospheric foods, oxygen and carbon dioxide, are always available in abundance, the mineral elements of the soil—particularly the NPK trio, nitrogen, phosphorus, and potassium—will be reduced by removal of crops,

and the soil thus will be rendered infertile. Rain water also tends to lower the fertility by carrying away nutrients in soaking its way through the soil. Some loss as gaseous nitrogen also occurs. This leads us to a consideration of the factors involved in the relationship of soil conditions to plant growth.

Fertility of the soil is dependent upon five factors:

1. Adequate supply of water
2. Adequate supply of air to the roots
3. Adequate supply of nutrients
4. Adequate space for the root systems
5. Absence of injurious substances.

These factors are not independent of one another, but are closely interrelated. In fact, the soil, the plant, and the climate form one interlocking system.

The properties of a particular soil required to satisfy these conditions are related not only to its chemical composition, but also to its physical condition and its biological state. These will now be examined.

The Constitution of the Soil

Physical Features. The water-holding capacity and the permeability to air and water are related to soil texture and structure, which in turn depend on the size and arrangement of the particles of clay, silt, sand, and gravel respectively. These properties are embraced in the word TILTH. The greatest factor influencing tilth is the COLLOIDS of the soil which are very active in supplying nutrients in an available form. The sand and gravel fractions of the soil, on the other hand, are inert. The colloids are made up of clay particles and that part of the organic matter known as humus. The soil particles are coated with a jelly-like substance just as if they had been steeped in it. Water and nutrients are held on the surface of the colloids, but rather loosely. The mineral nutrients are held in a more active (available) condition by the humus colloids than by the clay colloids. The humus hold is strong enough to prevent leaching and inactive fixation, but loose enough to be released to plants more easily than from insoluble mineral attachments such as the aluminosilicates constituting the clays. This distinction in favor of humus is important. Nevertheless, it must be kept in mind that no constituent is more necessary in proper proportions or more harmful in excess than clay, which in excess impedes movement of water and air to the roots.

Chemical Characteristics. The chemical content of the soil depends principally upon the nature of the minerals (largely made up of complex insoluble silicates) derived from the parent rock and also upon the nature of the residues of plants that have grown thereon since the soil occupied its present position. The original vegetation obtained its food supply from the "weathered" rocks by the solvent action of the carbonic acid and

possibly other acids exuded from the roots during the respiratory processes. By its decay the vegetation rendered these nutrients in a form more active and, therefore, more available to successive generations of plants. Historically, then, chemical nutrients came first and humus came afterwards.

The important chemical characteristic of a soil is its "supplying power," that is, the rate at which it can supply nutrients to the roots. The rate is governed by a number of factors such as the water content of the soil (the optimum is approximately 25 percent), the nature and condition of the soil colloids, the species of plant, and, when soil amendments are added, by this factor also.

The nutrients which plants absorb are taken into the root hairs as ions—that is, as electrically charged elements or entities—either from the soil solution or directly from the surface of colloids with which the root may form a one-phase system. This intake involves an expenditure of energy in which oxygen is absorbed and carbon dioxide (carbonic acid) is exuded from the root during its respiration. Hence the reason for suitable aeration for the roots: if oxygen is not present, roots have little power to accumulate nutrients. In this process of absorption the whole metabolic processes of the plant are involved, with all the factors influencing photosynthesis, particularly light and temperature, playing a role.

The Biological Phase. The organic matter returned to the soil by the decay of plants contains stored up energy derived from the sunlight by means of the chlorophyll of the green leaf. This is the phase that distinguishes the soil from the mineral matter of the parent rocks, for it now contains sources of energy not present in the original rock; the soil now becomes dynamic -a word much used by the humus school. Consequently, it is able to support the life activities of various organisms such as bacteria, fungi, algae, protozoa, worms, insects, and nematodes which obtain their food and their energy from the organic matter and bring about changes in the soil.

The decompositions affected by the soil population supply nutrients essential to the plant, improve the tilth of the soil, and remove soil products which would be injurious to plant life if they accumulated. Because of the importance of this decaying organic matter we shall now consider it in more detail.

The Soil Organic Matter

The organic matter of the soil consists of undecomposed and partially decomposed (and still decomposing) material together with simple soluble decomposition products and some materials that resist decomposition. The undecomposed material serves as a reserve supply for the whole series of chemical reactions involved in decomposition and helps to give better aeration and drainage.

Several types of decomposition products are known, the most important being those from the decomposition of the cell structural material and of the proteins.

The Soluble Decomposition Products. The soluble decomposition products of the organic matter consist of calcium carbonate, nitrates, and carbon dioxide, all of which are derived from the decomposition of the proteins of the plant. The capacity of a soil to provide nitrate-nitrogen is a fair measure, therefore, of its content of organic matter. The nitrates are readily lost from the soil by direct absorption by plants, by leaching, or by decomposition. These losses are compensated by fixation of gaseous nitrogen from the air by a bacillus which penetrates the root hairs of legumes weakened by lack of nitrogen compounds. Deriving its energy from the plant sap, this bacillus synthesizes complex products from them and the nitrogen of the air and transmits them to the plant.

The maintenance of the supply of nitrogen is of particular importance. Totally there is a serious loss when soil is cultivated and the bacterial gains from the air do not balance the loss by leaching and crop removal. Nitrogen fertilizers help in balancing the total net loss; moreover, they can help to increase the amount of active (available) nitrogen where the conversion into simple forms is too slow.

The Humus. The partially decomposed material contains the dark brown or black product known as HUMUS, derived from the decomposition of the celluloses. It is a composite entity, possessing all the characteristic properties of colloids, and capable, therefore, of binding together a light crumbling soil, and of making a sticky heavy soil more friable. Humus is the principal factor in increasing the water-holding capacity and pore space by causing the soil to be "puffed up"—properties which greatly enhance the fertility of the soil.

The accumulation of humus under natural conditions takes a long time; humus has, however, accumulated. But under the artificial conditions of agriculture, it is essentially transitional. Although decomposition is slow, the operations of tillage, which are stimulating to the plant, eventually hasten the plant's decomposition. Humus is thus being made and used up with relative rapidity under the artificial conditions of agriculture. Consequently, the various systems of agriculture should be greatly concerned with its maintenance, for this undoubtedly constitutes the ultimate problem of the use of the land all over the world. The importance of humus, however, should not be stressed to the neglect of the properties of the clay colloids. Both phases have their functions, and of particular importance is the type of dominant element combined with the clay. A calcium clay provides good tilth, whereas a sodium clay is sticky. Liming not only neutralizes the soil acids, which continually increase even under

natural conditions, but forms the type of clay colloid most favorable to plant growth.

The Soil Amendments. An increase in the supply of plant nutrients is accomplished in several ways: by the addition of composts, manures, commercial fertilizers, and lime, and by the plowing in of green leguminous and other crops and the digging in of stubble. The composting of animal and plant refuse is an ancient practice, as also is the addition of lime. The main clash of views of the heretic and orthodox schools centers upon the methods of maintenance of the fertility of the soil. The humus school claims that soil fertility can be maintained only by composts, that is, by "natural" organic manures; whereas the orthodox view is that inorganic fertilizers are required in addition to humus to balance the soil losses.

The scientific case is founded upon a wide range of experimental work throughout the world. These experiments hundreds of thousands of them—show that losses of that important trio, nitrogen, phosphorus and potassium, cannot be replaced except by such large additions of compost material as the labor and transportation difficulties involved would make impracticable. Calculations have been made that indicate that the abandonment of inorganic fertilizers on a world-wide scale would inevitably lead to high prices and famine.

Plant Hormones. Very minute amounts of certain organic substances (many of which have been synthesized), such as indole acetic acid, when applied in dilute solutions to roots, and in some cases also to stems, can stimulate or induce root development. The possibility that some of the virtues of organic manures may be due to such growth substances has not been overlooked. But so far none of these hormone or vitamin-like substances has actually been isolated from any compost material. Owing to the very minute amounts that are effective, their isolation, if they are present, is a problem of considerable difficulty. Nevertheless, theoretically. the production of such plant growth substances during the processes of decomposition of organic matter is possible and such substances have been obtained from urine and from certain fungi.

The Mycorrhizae (from the Greek meaning ROOT-FUNGUS). One of the leaders of the humus school places special emphasis on the role of the mycorrhiza-forming fungi which are able to invade the roots of some plants. The claim is made that the fungus threads digest food (proteins particularly) taken from the organic matter in the soil and the plant subsequently feeds upon this pre-digested food. The theory appears to violate all the known facts concerning the mineral nutrition of plants. Not all plants are mycorrhizal—the cabbage and tomato for example. The weight of evidence—and it is considerable—is that the mycorrhiza-forming fungi function with respect to supplying food to plants in the same manner as

do all the other soil organisms, that is, by the decomposition of organic matter.

In this connection it is to be noted that it is possible to grow plants successfully and sometimes more healthily in water cultures containing salts devoid of all organic material, such as in the method known as hydroponics or soilless culture.

Similarity of the Form of Nutrients from all Sources. It should now be clear that whether composts, farmyard manure and other organic manures, or inorganic fertilizers are applied to the soil, there is no difference in the form in which plants derive their nutriment from each of these sources. As we have seen, the complex organic compounds are broken down to simple substances and among the products are several identical with or similar to the nutrients supplied by fertilizers, such as carbonates (bicarbonates), nitrates, phosphates, potassium, calcium, magnesium, etc.

The statement that no difference exists needs the qualification that later investigations may definitely prove that organic manures may supply hormones and that the mycorrhizal symbioses may be important to certain species of plants.

Next Month

Dr. Thomas's article on "Composts, Manures, and Inorganic Fertilizers" will be concluded in the October Journal, with a consideration of the Control of Soil Microorganisms, the Supplementary Nature of Organic and Inorganic Fertilizers, and the Humus School's Specific Indictments Against Fertilizers, including the alleged effects on the soil, the alleged effect on the plant, and the alleged effect on the quality of the crop.

Bringing in the Birds

By Lorine Letcher Butler

WITHOUT birds the most perfect garden seems lacking in charm. There may be beauty of color and arrangement, but the birdless garden is as cold as the statue of Diana at the end of the path.

Birds are the expression, one might say, on the face of the garden: the flashing of bright wings among trees and shrubbery; the splashing and fluttering in the bird bath; fighting on the lawn; a long summer day made musical with birdsong and busy with the comings and going about nests; and the winter scene enlivened by the friendliness of the cold-weather

birds. When birds arrive in the garden, the garden comes to life and chill dignity departs.

But birds do not come to the garden just because one would like to have them. Food is the lure—and birds go wherever they find the berries

Evergreens furnish both nesting sites and food for birds. Here a young robin is perched on a branch of a spruce tree. (*Photograph by Lynwood M. Chace from NAS.*)

and seeds they like. Some berries and other fruits are so generally popular that many kinds of birds will gather for the feast. Certain birds, however, have such decided preference, that almost invariably they come only where a favorite tree or shrub grows.

This interdependence of birds and plants is a happy arrangement for the gardener, as most plants that attract birds are decorative and add much to the beauty of the garden. The flowering crab that glorifies the landscape in spring bears fruit that hangs on through the winter to be enjoyed by the wintering robin and waxwing. Flowering dogwood that adds to the pink and white loveliness of May is equally beautiful in the autumn with its crimson leaves and berries. These fruits do not last long, however, as they are the delight of eighty species of birds. Cardinal, flicker, catbird, and brown thrasher linger as long as the dogwood berries last.

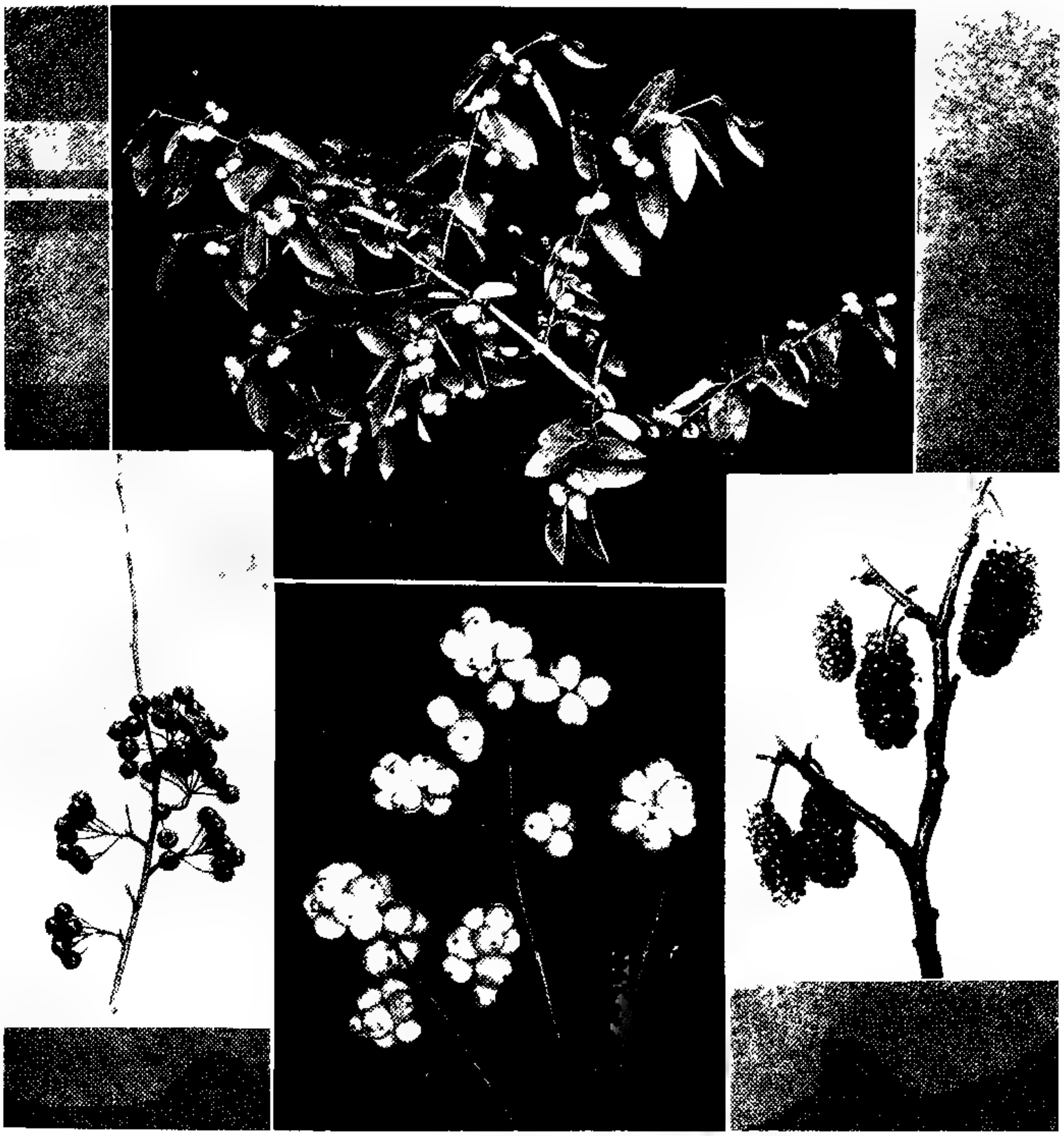
Birds have an eye for color—in fact, the bright hue of berries often serves to attract the attention of hungry birds flying overhead. The mountain-ash, with its large heavy clusters of orange-colored berries, is one of the spectacular trees of early autumn, and it is high on the favored list of birds. The orange and red fruits of bittersweet, a standby of migrating birds, attract much admiring attention from people in autumn, after the leaves have yellowed and fallen. The birds flying southward also notice them and descend for refreshment. The birds carry the seeds, and thus bittersweet finds a new home far from its native fencerow.

Bittersweet has found its way into the flower catalogs along with many other favorite plants of birds, such as Virginia creeper, snowberry, trumpet creeper, shadblow, and even sunflowers. These native plants of fields and woods which bear fruits or seeds that are popular with birds are now listed in the flower catalog side by side with the *haut monde* of the flower world. But after all, there are few plants in our garden whose ancestry cannot be traced to flowers and shrubs that once grew wild.

While birds in general are classified as either insectivorous or seed-eating, very few species adhere strictly to their preferred diet. Warblers are almost entirely insectivorous, yet the myrtle warbler owes its name to its fondness for myrtle-berries, or bayberries, as they are more often called. The Carolina wren and black-capped chickadee, also of insectivorous inclination, are among the seventy-three species of birds that are devoted to the bayberry.

Nor do the seed-eaters neglect an opportunity to pick up a tempting bug, and during the summer they give much time to the pursuit of animal life, as the food of young birds is soft-bodied insects.

Nearly all birds, other than those that are strictly insectivorous, delight in the soft pulpy fruits of summer and the fleshy berries of autumn. When the white flowers of shadblow, that are among the first spring blossoms,



FRUITS TO ATTRACT BIRDS TO THE GARDEN

Honeysuckle (above) is a favorite. Chokeberry (left), snowberry (center) and mulberry (right) are also ornamental shrubs which together can provide food for the birds for many weeks in summer and early fall.

develop into the bright berries of June—when it is called Juneberry—orioles, tanagers, cardinals, waxwings, catbirds, and robins flock to the feast, the meat-eaters and seed-eaters together. Mulberry and wild cherry have even a larger following among the bird population. Such misunderstandings as may arise between the farmer and the robin over the farmer's cherry crop can be avoided if wild cherries and mulberries are made available, as birds prefer wild fruit to the cultivated varieties. And mulberry

is the dependable standby of summer, its fruit ripening continuously from June to September. The chokeberry that appears in September is a favorite with meadow lark and brown thrasher.

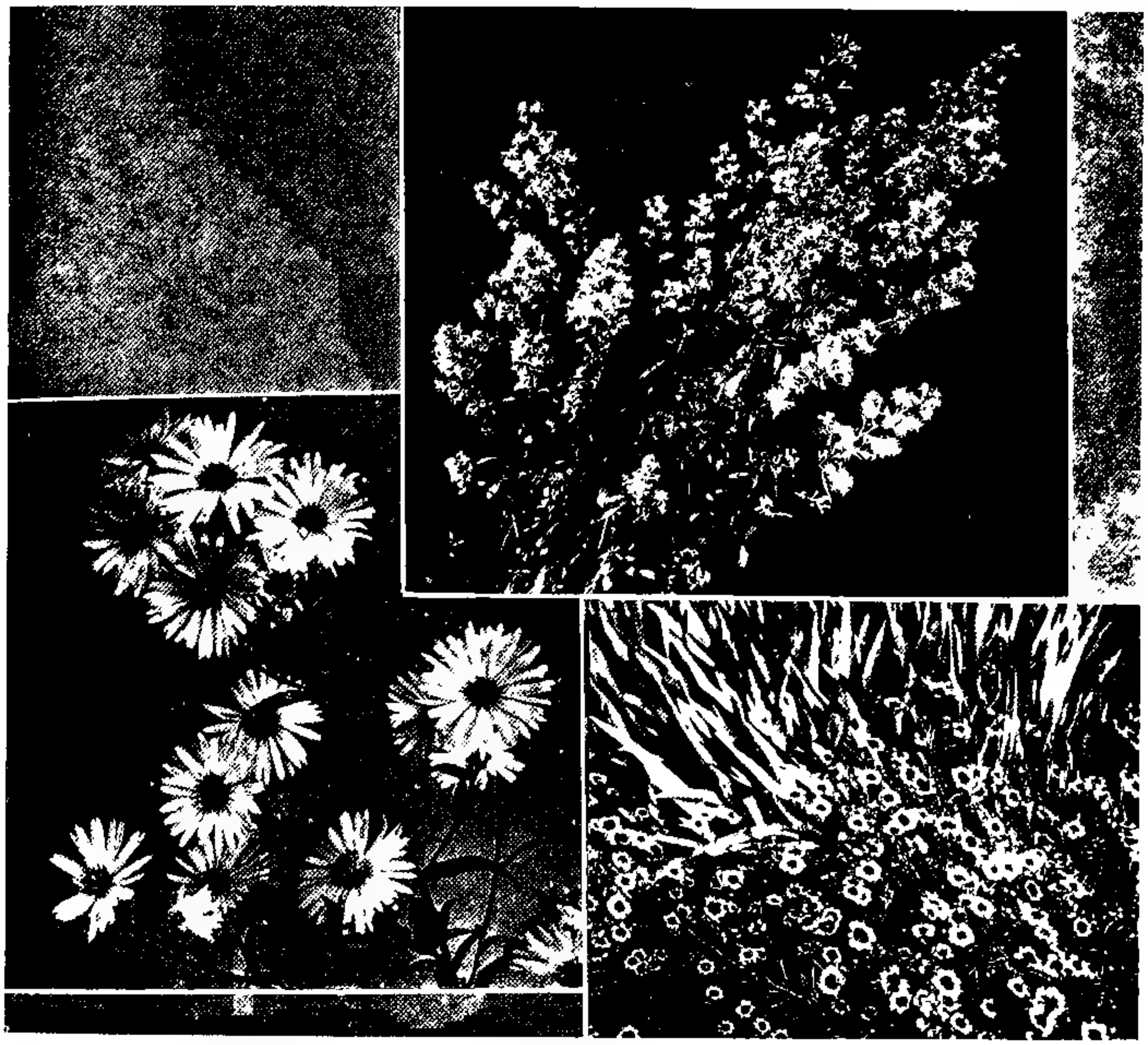
When a favorite fruit ripens, somehow the word gets around and birds flock to the scene. Likewise where the trumpet creeper or coral honeysuckle bloom, the ruby-throated hummingbird is almost sure to come. The hummingbird, like Eugene Field, likes any color as long as it is red. Even a tiny red vial filled with sweetened water and hung from a shrub, or a vial of other color tied with a red ribbon, will lure the scintillating hummingbird. But trumpet creeper and coral honeysuckle are his favorite flowers—trumpet flower coming first.

No other bird has the same relation to flowers as has the ruby-throat. Together with bees and butterflies he sips the nectar from deep-cupped flowers, though he does not neglect to pick up the tiny insects he finds crawling about the flower's edge. His long needle-like bill is well adapted to probing the depths of the trumpet creeper or the fragrant interior of honeysuckle blossoms. The trumpet flower that is too deep for bee or butterfly reserves its nectar for the hummingbird, and so the plant is regarded as his own.

Columbine that hangs its head downward also seems partial to the ruby-throat, as its nectar held aloft in the five curved horns of the flower arrangement is entirely out of reach of butterfly or bee. Even those with long tongues cannot negotiate the passage, as an insect's tongue can move only in a straight line. Here the hummingbird has the advantage; his long flexible tongue can sweep around the curve to the tip of the columbine's horns and scoop up the last bit of nectar. The bees, however, have a way of getting even with the columbine and the hummingbird. Sometimes they nip a hole in the end of the flower and steal the honey that was intended for the bird.

Some of the finest songsters, as well as the handsomest birds, are among those whose favorite food is weed seeds. One may wonder then, how to attract the goldfinch, the rose-breasted grosbeak or the song sparrow, without having to provide a weed patch. There is a way. The production of certain annual plants that possess botanical relation to the weeds upon which these birds feed, will bring the seed-eaters to the flower border.

The goldfinch's paradise is an abandoned field overgrown with daisies and goldenrod. There he clings to the branches and pecks at the seeds in summer, and clings and sways on the same brown stalks in winter. But the "wild canary," as this talented singer is sometimes wrongly called, can be lured from his beloved weed patch to the garden by the presence of those relatives of the goldenrod and field daisies—coreopsis, cosmos, calendula, and other composite flowers, such as bachelor buttons, asters, daisies; or by other flowers that are prolific in seeds—forget-me-nots,



Goldenrod, aster, and coreopsis are among the wild flowers and their relatives which the birds appreciate when they find them in the garden.

coxcomb, poppies. These flowers are particularly attractive to the finch family, all of which are seed-eating birds.

The trees and flowering shrubs that adorn the garden and supply food for birds also furnish nesting sites. There are birds that prefer the tree tops, as the oriole that swings its pocket-like nest from a lofty limb; and the low-nesting birds, as catbird or brown thrasher, that like the seclusion of dense shrubbery. The low-growing cranberry tree with its decorative flat clusters of white flowers is a favorite retreat of the brown thrasher. A certain cranberry tree for a number of years has harbored brown thrasher families, and in the autumn when the thrashers depart, the white-throated sparrows move in. The flat clusters of crimson berries of autumn are a delight to behold, and they vie with dogwood berries in popularity with birds.

Evergreens, so important in both formal and informal gardens, are a social center for birds. In winter they seek shelter beneath the branches and many feed upon the berries or seeds. There are some birds with such a special liking for certain evergreens, that the name of the favored tree has become attached to their own, as the pine siskin, pine warbler, cedar waxwing, pine grosbeak. The pine seems to be a sort of arboreal godfather to a number of birds; and birds other than the cedar waxwing delight in the pungent seeds of red cedar—cardinal, purple finch, mockingbird, robin and bluebird among them. And these birds will brave the winter cold as long as these berries are abundant.

The cedar waxwing's affections are divided according to season. In winter it seeks the cedars where it enjoys food and protection from winter winds. But in summer it is known as the cherry bird, and the fruit grower is often outdone by the presence of this politest and most amiable of visitors.

The decorative holly, whose shining leaves shed snow in a magical way, is a home for birds in winter and the bright berries are a lure for many birds. Winterberry, also a member of the Holly family, and sometimes known as the northern holly, is associated with the ruffed grouse, who finds ample refreshment in the well laden branches. The winterberry loses its foliage early in the autumn, leaving the erect bare branches gleaming with their brilliant red berries.

In making a garden a resort for birds, water is as important as food, both in winter and summer. The bird bath is always an attraction, the birds gathering about it and politely awaiting their turn to drink or bathe. And in winter when drinking places are frozen over and there is no snow, birds suffer from thirst. A supply of fresh water or chopped ice is greatly appreciated by winter residents.

The care of birds is not a one-sided arrangement. They pay abundantly for any efforts made in their behalf. Aside from the adornment of their presence and the entertainment they afford, the birds render incalculable services in checking harmful insects and destroying weed seeds. During the summer when insect production is at its peak, a young bird eats its own weight in insect fare each day, and the parent birds work from dawn to dark to supply the prodigious amount of insect food needed by their ever-hungry families.

Then the winter birds arrive—the chickadee, nuthatch, downy woodpecker—to police the trees and shrubs. Each has its special technique for seeking out the insects or larvae tucked away in mistaken security beneath the bark or in crevices of trees.

The goldfinch and sparrows take care of the weed seeds. From the far North come the juncos, the tree sparrows and the white-throated sparrows. They join with the goldfinch and the song sparrow in the search for seeds.

In the tidy garden where weed seeds are not to be found, stalks of sunflowers that are left to stand brown and brittle, in some out-of-the-way corner, will insure the presence of these interesting visitors.

From either the coldly economic viewpoint, or the purely esthetic, we find bringing in the birds to be a profitable and entertaining project.

NOTES AND REVIEWS OF RECENT BOOKS

Chromosome Counts For 11,000 *Plant Species*

CHROMOSOME ATLAS OF CULTIVATED PLANTS. C. D. Darlington and E. K. Kanaki Ammal. 354 pages. George Allen & Unwin Ltd. London. 1945. $2.75.

This volume is chiefly devoted to a list of some 11,000 species of flowering plants, arranged according to botanical classification. The information for each species, tabulated by means of symbols and references, includes (a) common names, (b) uses to man, (c) geographic origin, and (d) chromosome number, with references to the literature. The number in the basic set of chromosomes characteristic of each genus is indicated and also the somatic number that has been determined for the various species. In some cases clones are noted; but the large number of horticultural varieties and clones are not indicated by their horticultural names.

The references to the literature on chromosomic numbers are assembled in 28 pages of bibliography with the names of the authors arranged alphabetically. It may be noted that the earliest date of a reference is 1902; that there are but 14 references to dates earlier than 1910, about 50 references for the years 1910-19 inclusive, some 300 for the years 1920-1929; and that the rest of the total of about 1500 are for the years 1930-1945. This attests to the rapid extension of cytological studies in recent years. Yet this bibliography does not list numerous important publications on cytology that do not definitely refer to the determination of chomosome numbers in a flowering plant.

A preface to the volume discusses the value of a logical and scientific integration of knowledge of classification with the results of plant breeding and genetics, especially that which includes evaluations of the role and behavior of chromosomes in the study of the processes of species formation and plant improvement.

There is also an introduction of 28 pages devoted to statements and evaluations of the knowledge that has accumulated regarding (a) the geographical origin of cultivated plants, (b) the role and behavior of chromosomes, and (c) the use and meaning of chomosome numbers. In this there is a timely and concise evaluation of the types of reorganization of chromosome sets in polyploidy within a genus and of the main changes that are known to occur in the structure and characters of chromosomes.

It is emphasized that, in regard to the chromosomes in plants, "number is, of course, only the beginning of the story" and that the chromosome atlas "is a first

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rough attempt but it indicates the scope of the materials and it suggests the plan for their investigation."

In its array of facts regarding chromosome numbers this "Atlas" is of value to botanists in general and to cytologists in particular. Its spirit and endeavor will be a stimulus to further discoveries and to a better co-ordination of further studies and evaluations that concern species formation and the development and improvement of cultivated plants.

A. B. STOUT.

New Slants on Soil Management

SOILS AND FERTILIZERS for Greenhouse and Garden. Alex Laurie and D. C. Kiplinger. 119 pages, illustrated, indexed, A. T. De La Mare Co., Inc., 1946. $2.50.

So much has been written in recent years concerning sand and gravel culture and the use of hormones and vitamins to stimulate plant growth, that it is a pleasant relief to take up this book. The authors, in their revision of an earlier work on soils and fertilizers (1930), have treated a time-honored topic in modern and understanding way. Not onl have old ideas concerning fertilizatio incorporation of humus, and the use c soil mulches been discussed but man new theories and practices have been pre sented with their practical applicatio The majority of these seem primaril designed for greater economy in plan and flower production.

Many of the major floral crops hav been discussed relative to nutrient de ficiencies and excesses with illustration showing the symptoms of each. This a valuable addition which should appea to the small as well as the large commer cial grower. In so far as the greenhous plants discussed are limited to the mor important commercial floral crops, th book seems of doubtful value to the sma home grower. Furthermore, in the ligh of the information presented, it is ques tionable whether the home grower coul properly diagnose the symptoms in ques tion, as they are quite similar to those oc curring from ofttimes faulty cultura practices.

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Nevertheless, the book is a stimulating, though not exhaustive, discussion of modern soil fertility and management and should be considered a "must" of all growers who still believe in growing plants in soil.

JOSEPH W. TANSEY,
Superintendent, "Uplands"
Mt. Kisco, N. Y.

Miscellany For Gardeners And Bouquet-Makers

AROUND THE GARDEN. Dorothy H. Jenkins. 187 pages, illustrated, indexed. M. Barrows & Co., New York, 1947. $2.50.

Week-by-week directions, telling what to do in the garden to make the work simpler and the results more beautiful where beauty is the aim. Many good ideas are offered for improvement of the garden, and each month is introduced with a few lines of pleasant description.

THE MODERN FAMILY GARDEN BOOK. Roy E. Biles. 160 pages, illustrated. Greenberg, New York 1946. $1.50.

Another reprint of a book issued first in 1935 and reprinted several times since, in 1943 under the title "The American Family Garden Book." Written essentially for the beginning gardener, the book covers a wide field of gardening activity, and is profusely illustrated with drawings.

YOUR BOOK OF GARDEN PLANS. Norman A. Morris. 95 pages, illustrated. The Garden Press, Los Angeles, Calif. 1946. $3.50.

Basic tenets of landscape design for the new property owner or for the old one who is making plans for improvements. Sketches which accompany the text on every page give good and bad examples of design and planting.

FLOWER ARRANGEMENT FOR EVERYONE. Dorothy Biddle & Dorothea Blom. 185 pages, illustrated, indexed. M. Barrows & Co., New York. 1947. $2.50.

A famous team of mother and daughter who have written on flower arrangement for many years, present a book with more than 80 photographs of flower arrangements, each one appropriately titled and the materials described. A brief text of background instruction runs along with the pictures.

A HANDBOOK OF POPULAR ANTIQUES. Katharine Morrison McClinton. 244 pages, illustrated, indexed. Random House, New York. 1946. $2.95.

Of greatest interest to the gardener and flower-lover is the chapter on flower lithographs. In addition, illustrations of bowls, pitchers, and teapots offer ideas to the flower arranger for unique containers.

EARTHWORMS: The Earthmaster System. Thomas J. Barrett. 86 pages, illustrated. Earthmaster Publications, Roscoe, Calif. 1947. $1.

A paper-covered book based largely on chapters taken from previously published works by the author and others, telling of the usefulness of earthworms in improving the quality of soil.

HERE'S HOW! TO GARDEN IN THE DALLAS AREA. Margie Korn. 40 pages, illustrated. Margie Korn, Redondo, Dallas, Texas. 1947. $.75.

A paper-bound book with convenient spiral binding, based on actual gardening problems with which the author was confronted while active in garden club work. The book is brief and to the point, and amusingly illustrated.

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Thoreau and His Surroundings After a Hundred Years

WALDEN. Henry David Thoreau. Edited and illustrated with photographs by Edwin Way Teale. 369 pages, indexed. Dodd, Mead & Co., New York, 1946. $5.

Only a modest man, one with the greatest reverence for truth, plainness, and the higher attributes of the common man, would try to introduce you to Henry David Thoreau by attempting an interpretation, and by means of a pictorial story of the simple observations contained in *Walden.*

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And yet Ed Teale, in the manner of the true scientist, roamed the woodland paths of Walden, paged through the musty diaries of Thoreau, canoed the Concord, talked with the numerous authorities on Thoreau before him, and read their accounts, compared the plants and animals of today with those of Thoreau in 1845 and 1846, and gave to us one hundred years after the original observations, the first complete edition of *Walden* fully illustrated with 142 original photographs, and an up-to-date account of the changes a hundred years have wrought.

Even if you have read *Walden* in other editions, you will want to have this new, illustrated *Walden,* interpreted and illustrated by Teale as a part of your nature library. You can then feel the reverence which Ed Teale felt when he called it "the greatest book ever written by an American"; and you'll understand the painstaking loving thoroughness that accompanied him as he endeavored to make this *Walden* an anniversary masterpiece. You will also get a glimpse of a great and humble present-day American author-naturalist, feeling very much at home writing and photographing at Walden in the haunts of an earlier great naturalist and writer.

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JOURNAL

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

AUTUMN EVENTS AT THE GARDEN

Third Annual Chrysanthemum Show and Program, **Oct. 24-26**

For details of the program, see page 233.

Members' Day, **Oct. 1 at 3 p.m. in the lecture hall**

Autumn Gardening and How to Do It

A practical demonstration given indoors on how to handle some urgent tasks.

T. H. Everett
Horticulturist

Free Saturday Programs

Beginning Oct. 4 and continuing weekly through Dec. 6 in the lecture hall at 3 p.m.

Oct. 4 ***"Magic in Agriculture"*** **and** ***"Masters of the Soil"***
Two motion pictures with sound

Oct. 11 ***Tulips and Daffodils for a Long Season of Bloom***
With a motion picture — *David Platt*

Oct. 18 ***Garden Herbs for Winter Use***
Elizabeth Remsen Van Brunt

Oct. 25 ***England is a Garden***
With 1947 garden scenes in natural color — *Alice Chauncey*

Nov. 1 ***"Appleland"*** **and** ***"Harvests for Tomorrow"***
Two motion picture films with sound and color

Radio Programs

A new series starting Saturday, Oct. 4, at 8:30 a.m. with T. H. Everett answering questions on gardening and giving timely gardening advice, and Helen Gibson interviewing persons of importance in the plant world and relating entertaining stories about plants. WNYC.

Museum Exhibits

British Gardens Through the Ages

150 fine photographs on view through the courtesy of "My Garden" magazine of London, showing historical, formal, royal, rock and water gardens, lawns and borders, landscape and wild gardens, trees, and gardens of today. The exhibit will continue through November.

Insect Pests of Garden Plants

Original watercolors by Eva Melady, used for the illustration of "The Gardener's Bug Book" by Cynthia Westcott; the exhibit to be continued through October.

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Composts, Manures and Inorganic Fertilizers

Their Function, Use and Effects on Soils and Plants

II

By Walter Thomas

WHY plants often need a measure of chemical, or "artificial," fertilizer in addition to the humus they obtain when manure is added to the soil or when cover crops are plowed under is explained by Professor Thomas of Pennsylvania State College in the concluding instalment of his article. In the first part, which appeared in last month's Journal, after relating the history of the ideas about the way plants obtain their nourishment, he listed five factors which influence the fertility of the soil, described the physical, chemical and biological characteristics of the soil, and elaborated on the constitution and effects of the soil's organic content. He concluded by pointing out that, provided plants are given the elements they need, numerous scientific experiments show that the form in which they find them in the soil makes no difference in their nutrition.

The Control of Soil Microorganisms

MANY attempts have been made to control the activities of soil organisms; but apart from the introduction of the nodule organisms to soils in which leguminous crops failed to grow well, none of the attempts have as yet become of practical importance.

One of the humus schools claims that certain secret preparations of theirs can hasten the decomposition of compost heaps and control fermentation. It is known that the conditions for decomposition in the compost heap are similar to those in soils: namely, aeration, moisture, temperature, not too great acidity, and sufficient nutrients—fats, carbohydrates, proteins and inorganic salts—each in suitable proportion to the others. The various schemes of composting are related to obtaining the optimum conditions with respect to these factors.

The raw material in a compost heap has a high ratio of carbon to nitrogen of about 50:1, whereas in humus the ratio is 10:1. Obviously, if large losses of carbon—that is of organic matter—are to be avoided, relatively high quantities of nitrogen must be present. In all other schemes of compost-making, nitrogen is added either in the organic or inorganic form. In the secret process mentioned, the inoculating material is a low nitrogen product formed from the fermentation of medicinal herbs, etc., in contact with parts of an animal organism. Without the addition of more nitrogen than is, apparently, supplied, it would be expected that very large losses of organic matter would occur. Under normal conditions not more than one-fifth of the organic raw material is converted into humus, unless nitrogen is added.

Supplementary Nature of Organic and Inorganic Fertilizers

The deduction from the facts thus far presented is that organic manures and chemical fertilizers both have their uses; one supplements the other. Composts contain not only humus but some supplies of the fertility elements as well. In this sense they overlap the function of chemical fertilizers which lack the decomposable plant or animal constituents on which some of the most valuable properties of organic matter depend; accordingly, inorganic fertilizers cannot fulfill all of the functions of compost material. But the "chemical" fertilizers have many advantages over organic manures. They can be easily applied at the most suitable time, and their great variety enables a selection of one or more nutrients to improve the balance. Moreover, they are in a readily available and concentrated form. These properties require knowledge and skill for the proper use of them.

On the other hand, composts have the advantage in that their use is safe in inexperienced hands, for they are not too rapid in their action. Against this advantage must be placed the fact that their composition varies considerably with the residue employed, so that the nutrients in them may not always be well balanced. Organic manures, moreover, do not always contain all the essential nutrients, especially those elements required in very minute amounts—manganese, boron, zinc, copper, molybdenum, cobalt, and possibly others. These elements are fairly uniformly distributed in rocks, but in some soils they are known to be either absent or unavailable to the plant. There is some evidence that one of the reasons for this unavailability may result from insufficient decomposing organic matter in soils where the humus maintenance has been neglected. However, where nature has omitted to provide in the rocks and soils sufficient amounts of all the major and trace elements, or if present originally they have been reduced by crops or leaching, application of composts from material produced on such land will not remedy the deficit. In some fertilizers trace elements are present as impurities and in some regions they are added to the fertilizers.

The Humus School's Specific Indictments Against Fertilizers

The inorganic or mineral fertilizers are referred to as "artificial" by the various humus schools. According to them, the only soil amendments that can properly be applied are the "natural" ones, meaning the products resulting from the decomposition of plants with or without the intervention of animals. The term "artificial" was applied when fertilizers were first introduced to distinguish them from farmyard manure. The designation is misleading, inasmuch as some of them are just as much products of nature and, therefore, just as natural as farmyard manure—possibly more natural. Examples are the kainits and other potash salts mined from natural deposits in Europe and this country; Chilean saltpeter (nitrate of soda) from mines in South America; rock phosphate from deposits in this country and elsewhere, and finally guano—the excrement of seafowls found mainly in islands off the coast of Peru.

There are castes too among the humus school. Condemning the use of fertilizers that are "chemical," one group, nevertheless, makes use of limestone, but objects to burnt (slaked) lime obtained from it. Some accept basic slag, a product of the steel furnace, and also rock phosphate, but ban superphosphate obtained from the latter, in which the phosphorus is in a more available form.

Alleged Effects on the Soil. When fertilizers were first used, many difficulties arose which field-plot experiments solved in most cases. The injuries resulting from the use of ammonium sulfate and of sodium nitrate may be cited. The former increases the rate at which lime is removed and, therefore, renders the soil quite acid. This is easily remedied by the application of lime. The continued use on some heavy soils of the other fertilizer mentioned (nitrate of soda) injures the texture of the soil when applied in large dressings, by deflocculating the clay through the formation of sodium carbonate. In such instances, other nitrogen fertilizers can be applied or a mixture of 1 part of ammonium sulfate with 3 parts of nitrate of soda can be used to form a balanced fertilizer without much change in the acidity.

The various humus schools are fond of using such examples in their argument against fertilizers. It is always possible to cite cases in which yields have been reduced by fertilizers, for in nearly all field-plot experiments certain treatments have been found unfavorable for different reasons, most of which are known. But there is not a fragment of evidence that when well-balanced fertilizers are used under proper conditions, any injury results to the physical or chemical condition of the soil.

All the troubles which the humus school attribute to the use of fertilizers existed before their discovery and are prevalent where fertilizers have not been used. Soil erosion existed long before the introduction of fertilizers;

it was a problem to George Washington. Erosion is related to the system of farming in which crops that are not protective are grown continuously. Humus loss is the most important causal factor by breaking down the compound soil particles.

With respect to soil bacteria, there is no evidence that fertilizers result in injury. No significant difference in their numbers has been found in field plots without any fertilizers and in those which have been treated with fertilizers continuously over a period of years. The number of bacteria and other organisms can be greatly increased by the addition of organic matter; but there is no virtue in mere numbers for an increase in their numbers during the decomposition of organic matter high in carbohydrates and low in nitrogen may deprive the plant of its nutrients for, as we have seen, the food utilized by both is similar.

Another argument of the humus school against fertilizers is that earthworms won't flourish in soils to which "chemicals" are added. This is only half a truth. The facts are—and there is much experimental work on the subject—that the injurious factor is soil acidity. It is true that fertilizer plots treated with ammonium sulfate without lime additions contain no earthworm casts, but that casts are more abundant in such plots when limed. Provided, therefore, the soil is not allowed to become too acid, earthworms thrive in plots which have received heavy applications of inorganic fertilizers. Earthworms and other small animals will migrate to soils particularly rich in suitable organic matter, but their numbers are not reduced by the addition of fertilizers even in ordinary soils. There is no doubt that the earthworm's contribution to soil fertility is considerable and possibly the subject should receive more attention by scientists.

Alleged Effect on the Plant. The anti-fertilizer crusaders assert dogmatically that chemical fertilizers increase the susceptibility of plants to insect, fungus, and virus attacks, and that plants grown on composts are free from these attacks. The experiments of orthodox science do not support these claims; rather the experimental facts—and they are considerable—point to their value in reducing many diseases. For example, it has been established that plants deficient particularly in nitrogen, phosphorus, and potassium are usually weakly and can quickly succumb to attack by pests. Deficiency diseases of other elements also are known. An excess of an element can also be injurious. Thus plants receiving an excess of nitrogen which produces a rapid, lush growth are more liable to fungus attack. Immunity to attack by many bacterial and virus diseases is conferred on plants receiving applications of potash salts, the ratio of potash to nitrogen being of particular importance. That humus does not confer immunity to virus diseases is shown by the well known fact that the potato and some other species are more susceptible when receiving dressings of farmyard manure. In the root-disease fungi susceptibility

to infection is a nitrogen effect; with some species the incidence of attack is increased and in others reduced by nitrogenous fertilizers, whether they are applied in the organic or the inorganic form.

Nutrition, accordingly, is an important factor influencing disease and insect attacks. And humus itself being an important factor in the plant's diet, insofar as it contributes to the virility of the plant, may help to reduce disease: but there is no evidence that chemical fertilizers increase the incidence of diseases or of pest attacks. The factor that has increased is our greater knowledge of and attention paid to them.

With respect to the humus school's charge that the use of insecticides and fungicides invariably follows the use of chemical fertilizers, a mass of evidence is available to prove that this is untrue. One illustration will suffice, namely the case of potato blight which caused the death by starvation of millions in Europe before fertilizers were used. The copper spray—Bordeaux mixture—is now accepted as an effective preventive. Of course, spraying with chemicals is to be regarded as a last resort after all sanitary measures have failed.

Alleged Effect on the Quality of Crops. The composition of the crop is affected by soil amendments in whatever form they are supplied. The need is for a proper balance between the various nutrients to supply the requirements of the plant as well as the nutritional needs of the animal or human consumer. No sound experimental evidence exists that organic manures have any special value with respect to quality or that well-balanced fertilizers are detrimental. Foods raised under the same conditions on organic manures and on chemical fertilizers have been carefully compared without any nutritional differences being found either with respect to proteins, carbohydrates, fats, mineral salts or vitamins. The problem of quality in foods is obviously complex and the surface of the subject has hardly been scratched.

In this discussion, which aims to prove that the humus school's attitude toward chemical fertilizers is fallacious, the reader will be aware from the manner in which the subject has been developed that there is no implication that chemical fertilizers should be used to the neglect of maintenance of the humus supply of the soil. On the contrary, as repeatedly emphasized, the orthodox school maintains that keeping up the humus supply is essential; that chemical fertilizers are a supplement to organic manures and are rendered more effective in the presence of humus. The soil does not seem to be able to provide sufficient of the major nutrients—nitrogen, phosphorus and potassium—for cropping needs. The idea of fertilizers is that of adding external supplies to balance the losses. If enough composts can be obtained from plant and animal residues, the plant's needs for mineral nutrients can be met. This is being done in specific regions where

plenty of cattle manure is available. It is not, however, possible to supply the mineral requirements by means of plant and animal residues on a world-wide scale. Compost material has been obtained from the land, whereas in chemical fertilizers the losses are made good from the outside. Furthermore, the addition of certain nutrients—for example, superphosphate—increases crop yields even when farmyard manure is used.

In review, then, we see that there is room for all methods of balancing the soil losses of the trio—nitrogen, phosphorus and potassium. The sound view is to use organic materials of all kinds for humus and chemical fertilizers for all kinds of additional nutrients. Extremist viewpoints should be avoided.

Rock Gardening in Westchester

With Descriptions of Some Choice and Dependable Subjects For the New York Area

By Harold Epstein

IN traveling through the suburbs of New York City, particularly in Westchester County and Connecticut, an observer readily discerns a substantial quantity of natural rock outcrops and ledges that abound in the area. Varying types and sizes of stone formations appear on a large percentage of home grounds through this region, and as a result, there are present many gardening and landscape problems. Of all the challenges in gardening, there are perhaps none greater than those presented by a plot with varying elevations and accompanying stone outcrops.

Considerable skill is necessary to cope successfully with these gardening problems for it requires a keen working knowledge of rock formations, plus a thorough familiarity with a wide variety of plant life. In some locations the natural stone does not require or even permit substantial changes in rock layout, but necessitates utilizing existent soil pockets. At other times, re-alignment of stones of one group may substantially improve their appearance as well as assist in creating additional or improved soil crevices. One of the fundamentals, though, is the principle of using as large a group of stones as can be obtained and handled, and so constructing a slope on which the stones will be securely and naturally placed.

Rock formations and slopes may occur facing any direction of the compass, thus materially affecting the choice of plant material for the ex-

Any Epimedium is a desirable plant for the rock garden, but one of the choicest varieties is Epimedium Youngianum var. niveum, with large white flowers on erect wiry stems. The plant here is shown approximately natural size, as it grows against the background of a tree trunk in the author's own garden.

posure. It is unwise to place plants haphazardly without some analysis of their requirements. From a practical viewpoint, there is some suitable plant for every conceivable condition in the garden—from a shallow dry crevice to a low boggy corner. Research and trial will eventually produce a subject to fit any requirement.

Continuous experimenting in Westchester County with hundreds of plants, in an endeavor to solve such problems, has brought forth many choice subjects that are fairly dependable and deserve much more encouragement in their use in the rock garden. The plants recommended below have been chosen to include some of each of the following types:—(A) tuberous, bulbous or rhizomatous; (B) herbaceous; (C) shrubby. They are all commercially available from sources specializing in better rock garden plants.

Bulbous Plants and Such

Cyclamen neapolitanum. It is somewhat surprising that this jewel has not earned a more popular reputation. It always evinces words of praise when in bloom, for its flowers are miniature replicas of the florist's tender cyclamen. Of the several species of *Cyclamen* available, *C. neapolitanum* is, without doubt, the hardiest and most dependable. There is just one bit of caution in regard to its cultivation: it cannot contend with too much stagnant moisture, and so a well drained raised pocket in the rock garden will best assure its success. It should be planted in a half-shaded position; in good leafy loam. A well chosen position will result in a group of self-sown seedlings around the tuber, and these, incidentally, are the only means of propagation.

A generous display of flowers usually appears in September, the colors varying in shades of pink. The albino form, *C. n. album,* is also desirable and may even be considered preferable by some. The foliage which follows the flowers is equally decorative in being ivy-shaped and marbled with white. It usually lasts through the winter, completing its cycle in early summer. This cyclamen is also excellent for potting, and may be used as a decorative house plant, particularly when in bloom.

Scilla sinensis is one of the more unusual hardy bulbs, first because of its late summer blooming, and secondly, because of its rose-colored flowers, which are distinctive in comparison with the more commonly known spring-blooming squills in blue or white. During May, the bulb produces foliage which persists to midsummer, when it dies down. After a few weeks of rest (at about the end of August) the flower scape and another crop of leaves come through the ground. The flower stalk grows to about a foot in height (although records indicate an occasional height of two feet), the raceme being about four or five inches long. This squill is extremely easy in culture, being tolerant of a wide variance of conditions, though it

Rare, but worthy, is this summer-blooming bulb, Scilla sinensis (frequently listed as S. japonica). The rose-colored flowers appear in late August with a fresh crop of leaves, after the foliage of spring and early summer has disappeared.

does best in partial sun in a large loamy open soil that is not baked too severely. The bulb can be depended upon for increasing by offsets which usually bloom in two seasons. Besides this increase, self-sown seedlings are generally available as additional plants. Unfortunately, this rather interesting bulb has not been widely offered commercially, although it is easy of propagation. It is occasionally listed under the name of *S. japonica.* Perhaps eventually some of the American bulb growers will produce sufficient stock to have this squill available to keen gardeners.

Iris cristata alba is a favorite among the rhizomatous plants. This eastern native is one of the prettiest of the smaller irises, and deserves front rank

in the rock garden plan. The attractive white form is preferred by many to the more commonly known blue flower, which varies considerably in tone. While not too finicky in its cultural requirements, this iris prefers full sun or light shade in a well drained leafy soil. Though it is a surface rooter, needing only shallow soil, it should not be permitted to become too dry. The entire plant grows to about six inches in height, and the two and one-half inch flowers, which are profuse in late spring, are carried on stiff three or four inch stems. *Iris cristata* is a rather thrifty grower and if it becomes too crowded it is apt to die at the center of the clump. While top dressing with sandy leafmold is helpful, it is advantageous to lift and divide the plants periodically. In planting of slopes where soil washouts need to be retarded, this iris is particularly useful.

Herbaceous Perennials of Distinction

Veronica spicata nana is one of the stronger evergreen dwarf ground covers of neat habit. While there are many varieties of *Veronica spicata* which are not adaptable for the average rock garden (some flower spikes reaching one and one-half feet), the plant referred to here produces a flower stalk only four to six inches high at the most. One of its assets is its June and July blooming period, which aids in prolonging the season of color in the rock garden. Though the plant is tolerant and will grow in most average soils with half to full sun, it should be lifted, divided, and replanted in small divisions every few years. This will avoid the deterioration of the old center of each clump. The blue color forms vary from light to dark blue, and there is also available a white variety, but it does not appear to have the charm of the other.

Epimedium Youngianum var. *niveum.* Although the reference here is to the small white variety, which is generally available, the same details will apply to all the others in this genus that are in the trade today. For a plant that has been known for centuries, it is surprising that it has not been more commonly adopted for general gardening use. All the epimediums are easily cultivated, being inexacting in their requirements. While they are basically woodland plants, experience has proved that they will tolerate a sunny spot or a difficult ledge where other plants may have failed. They are beautiful in both flower and foliage, although the plant is deciduous in the New York region. But this is no handicap, for the foliage does present an effective and interesting change in color from early spring, when it just emerges, to the autumn seasonal change. Epimediums are available with flowers of white, pink, lilac, rose, red, cream, and yellow, but their nomenclature throughout the trade is hopelessly confused. Basically, there are two flower forms—first, the smaller flower which appears on the varieties native to Europe and Asia Minor, and secondly, the long-spurred varieties, which hail from Japan. The latter are definitely the showier

flowers and really the elite of those available. Of the Japanese varieties, there appear to be but two color forms known—the rose-colored flower known as *E. macranthum* "Rose Queen," and the white form, *E. macranthum album.* All of the epimediums are useful in many capacities in the garden, either as ground covers in shady spots, under or among trees or shrubs, or as an edging to shrub and perennial borders. Or they may be used advantageously among the stone work in the rock garden. Like most herbaceous perennials, epimediums are benefited from division of the clumps every three to five years. Otherwise, the usual dead center will appear in each clump. If epimediums were better known, it is certain they would not be the neglected race that they appear to be.

Shortia galacifolia. While the United States can boast of a great number of excellent natives, there are not many plants among them that can be classed on a par with this. Shortia is the perfect plant for shaded slopes in the rock garden and as an underplanting for ericaceous shrubs such as azaleas and rhododendrons. This hardy little evergreen is a plant whose major virtue is its glossy green, almost leathery foliage. In fact, the added beauty of the fall and winter leaf coloring gives this woodlander an all-year decorative value. As the autumn approaches, the leaves turn brilliant vermilion, gradually darkening through the winter. In spring, the foliage reverts to its rich green coloring while the fresh new leaves unfold. The white flowers are five-petaled, frilled, bell-shaped blooms which rise about six inches above the foliage. While the usual cultural suggestions recommend full shade for their welfare, experience indicates that the greatest floral display results from some exposure to the sun. A planting facing west or northwest for a bit of afternoon sun, where it cannot become too dry, would be advantageous. The plants do best in leafmold soil, often requiring two years to become fully established in a new site, particularly if they have not been previously established in pots. While propagation can best be effected by careful division or by cuttings, fresh seed will also be found as a practical means of increase, although a very slow method. Any selective gardener with a proper shaded area should not be without a planting of *Shortia galacifolia.*

Small Shrubs for the Discriminating Gardener

Iberis saxatilis. Although generally regarded as herbaceous perennials, the candytufts are really classified as shrubs in the Mustard family. The neatest and most attractive of them is *Iberis saxatilis,* which is an easy rock garden subject. It is a prostrate growing species with dark green foliage and small heads of clear white flowers. The true species does not grow over three or four inches high, and, when not in flower, greatly resembles a miniature planting of yews. It is recommended for sunny and open planting among rocks, and there forms an excellent cover both

Herbacious in aspect, the perennial species of Iberis are actually small shrubby plants. I. saxatilis, a low prostrate plant with fine, dark, persistent foliage, is an especially desirable rock garden subject.

in and out of bloom. Propagation is easily effected by cuttings, which root readily.

Rhododendron indicum var. *balsaminaeflorum,* also known as *Azalea rosaeflora,* has been in cultivation for many years. It is undoubtedly one of the best and most reliable of the slow-growing azaleas for the New York region, and is excellent for use in the rock garden either as an individual specimen or as an extensive ground cover. It is a prostrate slow grower sending its branches outward and so remains a rather dwarf shrub, rarely exceeding a foot in height. It bears many double, clear salmon-pink flowers from May through June, spreading its blooming period over several weeks. It is adaptable, blooming best in an open exposure, although half shade is no handicap. The addition of leafmold to good loam is appreciated. Because of its distinctive color, the placing of this shrub in the rock garden requires care and consideration. Planting it adjacent to any magenta or bright red flowers should particularly be avoided. It is really a handsome shrub, appealing to most people who come upon it for the first time.

These are but a few of the many choice, dependable plants that experience has proved almost foolproof for rock gardeners in the New York region. Not one of them is really uncommon, but all should be utilized to a greater extent. The pleasures of rock gardening are enhanced by the almost unlimited number of plants that may be used by the gardener with a flare for experimenting.

Chrysanthemum Show At Garden Oct. 24-26

Program and Exhibits to Feature Three-Day Event

PROFESSOR ALEX LAURIE of Ohio State University will be the principal speaker on the program given by the New York Botanical Garden at 3 p.m. October 24, the opening day of the annual Chrysanthemum Show. "Chrysanthemums for the Millions" will be his subject. Immediately after, there will be a symposium on the outdoor culture of large-flowered chrysanthemum varieties, to be led by James S. Jack, Superintendent of Brookside, the estate of Mrs. Flagler Matthews, at Rye, N. Y.

Exhibits Indoors and Out

The Chrysanthemum Show, which will open at 2 p.m. Friday and will last through Sunday, October 26, is the third to be given at the New York Botanical Garden and the fourth in the history of the National Chrysanthemum Society, which, until last January, was known as the Eastern States Chrysanthemum Society. The competitive exhibits, arranged by this organization, will fall into six major sections, with 100 classes in all. These will be (1) chrysanthemums grown outdoors, (2) grown under glass, (3) pot plants, (4) arrangements, (5) displays, and (6) sports and seedlings. For the first time this year, there will be a children's show, to open Saturday noon in the basement of the Museum Building. This is being arranged in co-operation with Marvin M. Brooks of the School Garden Association.

It is expected that the Garden's outdoor display of chrysanthemums, near the Conservatory, will be at its peak at the time of the show. The gates to the grounds will be kept open until 6 p.m. to enable visitors to see this collection of flowers.

Questions Answered on Pests and Diseases

An exhibit of chrysanthemum pests and diseases and their control will be a feature of the occasion to be provided by the New York Botanical Garden, at the entrance to the lecture hall in the basement in the Museum Building. Dr. P. P. Pirone, Plant Pathologist, will be present to answer questions of visitors on Friday and Saturday, from 2 to 3 p.m.

On the Cover

The prize-winning chrysanthemums shown on this month's cover won an award in the first chrysanthemum show at the New York Botanical Garden in 1945 for Ernest L. Bertram, of Lancaster, Pa., who is now president of the National Chrysanthemum Society, which has been staging an exhibition at the Garden annually since that year. The chrysanthemums are of the large, commercial, incurved type.

On the opposite page

SOME PRIZE-WINNING CHRYSANTHEMUM ARRANGEMENTS FROM PREVIOUS SHOWS

Flower arrangements at the 1947 show will emphasize the use of chrysanthemums throughout the house

First prize and tri-color in 1946 was won by Mrs. George H. Hirsch of New Rochelle with the arrangement shown at the upper right. Beside it is a second prize arrangement from 1945, showing chrysanthemums with pine branches, done by Mrs. Edwin Meier, also of New Rochelle. Beneath it is another second prize arrangement, this one from last year's show, by Mrs. William Rathbone of New Rochelle. At the right is a first prize 1945 arrangement of chrysanthemums with autumn leaves in a copper dish, the work of Mrs. E. A. White, Jr., of Tenafly, N. J.

Chrysanthemum Society Workers

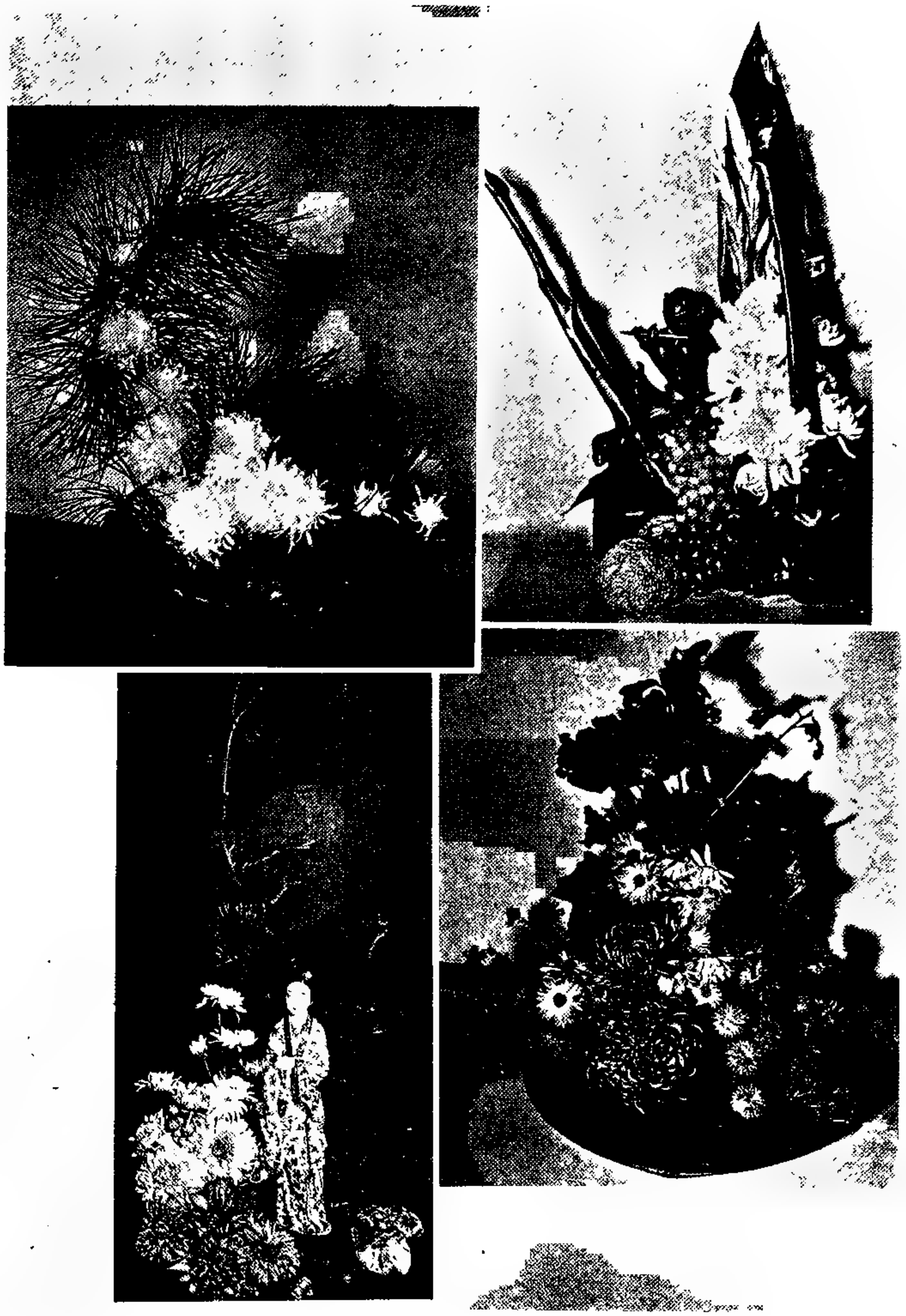
Committees for the Chrysanthemum Society are: General Chairman, Mrs. H. E. Kincaid, Mamaroneck, N. Y.; Honorary Chairman, James Stuart, Mamaroneck; Arrangements, Mrs. Loren R. Dodson, Mrs. Kenneth L. Stelle; Classification, E. L. Scott, Bogota, N. J.; Entries, Carl Toepler, Teaneck, N. J.; Information Booth, Mrs. Clifford B. Curtis; Judges, James Stuart, Mamaroneck; Program, Paul Frese, New York City; Publicity, Aleita H. Scott, Bogota; Secretary, Mrs. Thomas Farmer, Mamaroneck; Staging, James S. Jack, Rye, N. Y., and Fred Shumaker, Larchmont, N. Y.

Tea and Lecture

The New York Botanical Garden will be host to members of the National Chrysanthemum Society and to its own members at tea in the Members' Room at the close of the program in the lecture hall on Friday.

Visitors to the Chrysanthemum Show will be welcomed at the regular Saturday afternoon program in the lecture hall, at which Alice Chauncey, recently returned from England, will show her latest kodachromes of English gardens, accompanying them with a lecture entitled "England is a Garden."

On Sunday, all exhibits will be open to the public, in the Museum Building until 5 p.m., on the grounds until six.



PRIZE-WINNING CHRYSANTHEMUM ARRANGEMENTS

(*For description, see the opposite page*)

Where Was The Canker Worm This Year?

THE apparent absence of canker worms in the vicinity of the New York Botanical Garden in the spring of 1947 has brought about much discussion and speculation as to the cause. Several entomologists in the East were asked for their opinions in this situation. A number of theories have been offered but the majority seem to feel that the principal reason for lack of canker worms (or inch worms) this year is the natural cycle of abundance and scarcity of this pest.

Dr. Louis Pyenson of the Long Island Agricultural and Technical Institute at Farmingdale says:

> "The apparent lack of canker worms in your area might be due to natural cycles of abundance and scarcity."

Dr. Stanley W. Bromley of the Bartlett Tree Research Laboratories agrees saying:

> "The fall canker worm seems to be cyclic in nature and just at present we seem to be between outbreaks."

Following this same school of thought is Dr. Clyde C. Hamilton of Rutgers University, who says:

> "The absence of any numbers may have been due to the worms emerging and the cold weather killing many of them but I am more inclined to believe that it is due to there being very few canker worms last year. Infestation was rather severe during 1944-45 but had declined considerably during 1945-46."

Another theory of the cause of the absence of canker worms in New York City this year, according to Brayton Eddy of the New York Zoological Society, is the fact that we have had a very irregular winter and spring. He attributes the low canker worm population to two main causes:

> 1. "The fact that we had a very irregular spring, first cold then hot with plenty of moisture, undoubtedly killed a great number of the young caterpillars upon emergence.
>
> 2. "The relatively warm winter with extreme changes in temperature promoted the development of the embryo to a point where a sudden cold spell resulted in death."

Dr. Pyenson suggests as another cause, besides the natural cycle of the canker worm mentioned previously, the following:

> "It might be due to the very warm spell which we had early in January which may have stimulated the fall canker worm eggs to start development and then freeze in the cold spells that followed."

Expounding the theory of parasitic conditions, Hugh Glasgow of the Agricultural Experiment Station at Geneva, N. Y., says:

> "I would be inclined to think that perhaps parasites, which also vary in abundance, might account for the apparent disappearance of the canker worm in your area."

To which Brayton Eddy adds:

> "It is quite possible that a wilt disease caused mortality among canker worms."

Apparently, the canker worm has diminished in most of the eastern states this year with the exception of Long Island, where they have been more abundant than in previous years and have done considerable damage. Dr. Pyenson believes that Long Island may not have had the extreme temperature ranges that existed further inland and that this may account for their survival on the island but not upstate or in Connecticut.

* * *

After the foregoing statements had been made about temperatures, cycles, enemies, and such, Dr. B. O. Dodge suggested that one reason why the Garden itself was fairly free of canker worms this year was the thorough spraying program that had been carried out for several years. "If you kill the larvae early in the season," he pointed out, "they can't turn into moths to lay eggs for the next generation of worms. After several years you are bound to get a reduction in pest population. However, I won't deny the existence of parasites nor the weather factors which help to keep insects under control. It is undoubtedly the combination of causes that has saved our trees from being seriously damaged this year."

NOTICES AND REVIEWS OF RECENT BOOKS

Up-to-Date Handbook On Chrysanthemum Culture

CHRYSANTHEMUMS FOR PLEASURE. Ernest L. and Aleita H. Scott. 105 pages, illustrated, paper covered. Published by The Scotts, Bogota, N. J., 1947. $2.50.

For many years the Scotts have been known as gardening enthusiasts. Chrysanthemums and primulas have been their pets. The quality of the chrysanthemums displayed by them at local shows in past years warrants their getting into print and telling others how they do it. This is exactly what they have done. We are taken from planting time through summer. Soil types, fertilizer, watering and supports are discussed first. Then we read of all the insects and diseases likely to infest this plant, and the methods of control.

Care during blooming time makes interesting reading. Too many people think that chrysanthemums can be cut from the garden and staged on the show table without the care that is called for in the fickle climate of the metropolitan area.

Some sound advice as to reasons for winter killing are given, as well as directions prior to propagation. At this point the new year is begun and the description of various methods of starting young plants makes it possible for all to grow chrysanthemums.

In classification the Scotts divide the garden chrysanthemum into 13 classes. This will be of value to the prospective exhibitor in competitive classes at the flower show. On reaching this part of the book many gardeners may feel they have received sufficient information to go ahead and by following the directions

find real satisfaction with the flower, but here where Part II begins we may matriculate and find ourselves with advanced scientific teachers. The use of chrysanthemums in the garden as displays in mass and color harmony, the general principles and specific directions for pinching, disbudding and the timing of the bloom are all of prime importance for the exhibitors of fine quality flowers and are essential subjects for the student. Greenhouse culture and shading for early blooms are other subjects that will give enlightment to many. This brings us to the show board where the results of our labors will be judged, and notes on arrangements are not forgotten.

This book brings us up to date in chrysanthemum culture and we strongly recommend it.

JAMES G. ESSON,
Gardeners' Chronicle of America.

Vegetables, Flowers, Trees For the South

THE SOUTHERN GARDENER. Floyd Bralliar. 227 pages, illustrated. The Nashville Tennessean, Nashville, 1946. $2.

The veriest amateur can have a flourishing vegetable garden if he studies this book, and applies the information gained. The directions for selection of site, preparation of soil, choice of what to plant, and the actual planting are practical, simple, right down-to-earth. The author rightly deplores the waste of natural humus in the South, and makes excellent recommendations. Even an old gardener gets some new ideas!

Suggestions as to transplanting, fertilizing, and the use of insecticides all are good.

One of the most interesting features is a list of well known garden flowers that were developed from native southern species—among them, *Phlox Drummondi.*

Dr. Bralliar does not seem to have become quite so well acquainted with southern trees, for there are some curious omissions. In mentioning native red maple (*Acer rubrum*), he says nothing of its two most striking features, its brilliant autumn coloring, and the blazing "keys" in early spring. But he does recommend three fine trees that have been largely overlooked in this area: linden, cork elm (*Ulmus alata*), and tulip tree.

Dr. Bralliar says that dogwoods like an alkaline soil. He can not be referring to *Cornus florida,* for it must have acidity, and plenty of humus.

It is unfortunate that a book with much to recommend it should contain so many typographical errors.

CAROLINE DORMON,
Saline, Louisiana.

For the Commercial Grower

ONION PRODUCTION. Donald Comin. 184 pages, illustrated, indexed. Orange Judd Publishing Co., New York. 1946. $2.

Here is a practical book for the truck farmer or commercial grower handling large acreage. The author has made liberal use of the findings of various State Agricultural Experiment Stations and U. S. Department of Agriculture publications.

The home gardener may find it lacking in general cultural detail that would apply to his small bed of onions. The subject of pest control might have been carried further, giving fuller data, for example, on the most recent methods of thrips control.

The author's frequent recommendation of crop rotation, to insure freedom of disease and best yields, indicates a keen understanding of his subject.

Handsomely bound, well written, with numerous illustrations and tables, the book is good value at its modest price, for it is an up-to-date reference of approved methods of onion and onion seed production.

FRANCIS PATERSON,
Superintendent, Panfield Corporation
Huntington, Long Island.

Nutrition Values

THE CHEMICAL COMPOSITION OF FOODS. R. A. McCane & E. M. Widdowson. 148 pages, indexed. Chemical Publishing Co., Brooklyn, 1947. $3.75.

This book was written primarily for the use of nutrition chemists, dieticians and physicians, not for the average housewife. Though it contains recipes for a good many dishes, the proportions of the ingredients are generally expressed in ounces and pounds.

The major portion of the book consists of two tables giving the chemical composition of foods. In the first of these, the mineral composition of the foods is expressed in milligrams per 100 grams, the proteins, fats and carbohydrates in grams per 100 grams and the energy in calories per 100 grams. In the second table, the figures have been converted to express the composition and energy per ounce.

ILDA MCVEIGH

Two Books to Charm

HERBS, SPICES AND SEASONINGS. Jean N. Lesparre. 73 pages. Crete Dahl, Stamford, Conn., 1946. $1.

IN AN HERB GARDEN. Annie Burnham Carter. 202 pages, indexed. Rutgers University Press, New Brunswick, N. J., 1947. $2.

Two books have just reached my desk. The first is small enough to slip into one's bag or the pocket of an apron for easy reference.

Its title is "Herbs, Spices and Seasonings," and it is a well compiled little encyclopedia, giving the botanical name, origin, and description of each plant. It tells how to harvest and how to use each herb. Here is a wealth of information in a space of 73 very small pages.

The author, Jean Lesparre, is an internationally known chef, who has had vast experience both abroad and in America.

This is a splendid addition for the culinary herb shelf.

* * *

The second book "In an Herb Garden," is enchanting.

Mrs. Carter, who created the Shakespeare Garden at Plainfield, New Jersey, brings to this book a keen knowledge and love for the old traditions and herb lore. We follow her from the month of March when she conceived the idea of planning a herb garden, on down the months until the cold days in November, when she puts her garden to sleep.

Besides a wealth of useful information and a sound background of the history of herb literature, Mrs. Carter all through the book has cast a subtle charm. As one follows her planning and planting this garden, aided by her herb-wise old Italian gardener, one feels that those who read it can not fail to want to experiment in growing some of our beloved herbs.

NOREEN SHERIDAN CAPEN,
Chairman, New York Unit,
Herb Society of America.

Mycological Background

HENRICI'S MOLDS, YEASTS AND ACTINOMYCETES. A Handbook for Students of Bacteriology. Charles E. Skinner, Chester W. Emmons and Henry M Tsuchiya. 409 pages, illustrated, indexed. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Limited. Second edition, 1947. $5.

This book is completely rewritten and has two entirely new chapters covering material barely mentioned in the first edition. The book is intended for use by students of bacteriology who have no mycological training.

The second edition stresses mycology, medical and industrial applications of mycology, pathology, physiology, morphology of fungi; classification, culture media, cytology, genetics, life cycles. The book also has a good index. A well selected list of literature references is given after each chapter.

Information on certain fields was restricted during the war, and consequently there are some important subjects omitted. Certain chapters appear to be out of balance in respect to others. *Torula* and *Torulopsis* are changed to *Cryptococcus*. The "Fungi Imperfecti" are classified on page 33 under "Perfect Fungi." The authors have not accurately and precisely defined the Pasteur effect. There are few errors in printing; however, page 3, last line—nucleic acid is misspelled.

Figures 5, 21, 26, 27, 28, 30, 46, 47, 48, 49, 64, 68, 69, 90, 94, 95, 101, 107, and 126 do not approach the high standards set by modern photography.

This book will be useful to students desiring general information in certain fields. It brings together information concerning a number of important subjects which the student of bacteriology may find of interest and helpful in his work.

CHARLES N. FREY,
The Fleischmann Laboratories.

New Approach

A TEXTBOOK OF SYSTEMATIC BOTANY. Deane B. Swingle. 343 pages, 106 figures. McGraw-Hill, New York. Third edition, 1946. $3.50.

There is little point in reviewing this edition of a well known textbook except to note that, for the first time, some attention is given to an approach to the subject "by way of genetics, ecology, cytology, and geography." While it is encouraging to find this in a textbook of systematics, it is perhaps unfortunate that Professor Swingle intended that it be addressed to students with perhaps no more background than a first course in General Botany. This, therefore, limited the extent to which he could pursue these highly important topics. The treatment of plant groups is essentially that of the previous edition.

W. H. CAMP.

Historical

SCIENTIFIC SOCIETIES IN THE UNITED STATES. Ralph S. Bates. 246 pages, indexed. John Wiley & Sons, Inc., New York. 1945. $3.50.

This book contains not a list, such as one might expect, but rather the story of the inauguration, growth, and development of scientific societies in this country since the early 18th century. Chapter headings are: Scientific Societies in Eighteenth Century America; National Growth, 1800-1865; The Triumph of Specialization, 1866-1918; American Scientific Societies and World Science, 1919-1944; The Increase and Diffusion of Knowledge. The bibliography of nearly 30 pages serves as a guide to the various societies under a number of different headings.

Laboratory Techniques

METHODS OF VITAMIN ASSAY. Edited by Association of Vitamin Chemists. 185 pages, charts, index. Interscience Publishers, New York. 1947. $3.50.

A large number of scientists have contributed to this work, by outlining the methods they use or reviewing reports of others. Chapters cover Vitamin A, Carotene, Thiamine, Riboflavin, Niacin, Ascorbic Acid, and other vitamins.

Simplified Text

COMMON - SENSE GEOLOGY. George McCready Price. 239 pages, illustrated. Pacific Press Publishing Association, Mountain View, Calif. 1946. $2.

Much of the world is covered in this very brief book, based on the same author's earlier college texts which are now out of print. The book closes with a Biblical quotation about the Flood.

Vocational Guide

THE SEED INDUSTRY. Edgar J. Clissold. 44 pages, illustrated, bibliography. Bellman Publishing Co., Boston. 1946. $1.-

The third in a series of booklets on American industries, this study appears to cover every conceivable phase of work, including background and future, for anyone concerned with the business of growing or selling seeds.

Notes, News, and Comment

Radio Programs. A new series of radio programs, arranged by the Garden's Manhattan office, will be given every Saturday morning from 8:30 to 8:45 over Station WNYC, beginning Oct. 4. Timely advice on gardening tasks and answers to gardeners' questions will be given by T. H. Everett, the Botanical Garden's Horticulturist. Also on the program will be talks and interviews concerning the world of plants by Helen (Mrs. Charles De Wolf) Gibson, who has been appearing during the past two years on a child welfare program on WNYC. "Calling all Gardeners" is the title for the new radio program. Listeners are invited to send their questions to the program in care of Station WNYC, New York 7.

Gift of Green. The Garden's motion picture, "The Gift of Green," which was produced in 1946 by the Sugar Research Foundation, has been translated into 21 languages: Slovak, Bulgarian, Persian, Finnish, French, Roumanian, Dutch, Siamese, Polish, Portugese, Chinese, Serbo-Croat, Swedish, Italian, Danish, Arabic, Spanish, Hungarian, Czech, Turkish, and Greek. For distribution in Eng-

lish-speaking countries 84 prints have been made in English from the original. In less than a year, "The Gift of Green" has been shown before nearly 300 separate audiences, most of them schools, but others including camps, garden clubs, churches, and Y.M.C.A. groups.

Canadian Meeting. At the summer meetings of the Botanical Society of America, the American Society of Plant Taxonomists, and related societies, beginning August 20 in Montreal, Dr. W. H. Camp took part in the symposium on the Northeastern Deciduous Forest with an address on speciation in the area. Following the meetings, he accompanied the group on a tour of the Gaspé, including Mt. Albert. At the conclusion of this trip, he did further collecting, with Jason R. Swallen of the U. S. National Herbarium, in New Brunswick and Nova Scotia, on Cape Breton Island, and in Maine and New Hampshire. Shortly after his return to the Garden in mid-September, he proceeded southward to continue his collecting of oaks and beeches.

Mrs. John R. McGinley. At the age of 89, Mrs. Sarah Jane Atterbury McGinley, widow of John R. McGinley, died at her summer home at Manchester, Mass., August 24. She had been a member of the Advisory Council since April 15, 1926, and of the Corporation of the Botanical Garden since Jan. 12, 1931. She was a Fellow for Life of the New York Botanical Garden. Her permanent home was in Princeton, New Jersey. She is survived by four daughters.

Degree. Mrs. Annette Hervey, a graduate of Barnard College, who has been working at various times since 1942 in the laboratory of Dr. William J. Robbins, was awarded a Doctor of Philosophy degree from Columbia University in June. In recent years Mrs. Hervey has been working on experiments to obtain antibiotic substances from the Basidiomycetes. She began regular work in Dr. Robbins' laboratory July 1.

To Cincinnati. Selma Kojan, who has been Technical Assistant in the laboratory

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Wayside Gardens

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of Dr. A. B. Stout for the past three years, left the Garden at the end of September for the University of Cincinnati, where she will begin work toward a master's degree. Under Dr. Stout's direction she will continue investigations on sterilities in petunias, on which she had been working at the Garden. She will hold a teaching assistantship in the Botany Department at Cincinnati.

Window. In the early summer, as part of a series of displays on museums of New York, the International Business Machines Corporation devoted a window at 590 Madison Avenue to the New York Botanical Garden, using two large photographs, one of the Museum Building and one showing the chrysanthemum border outside the Conservatory.

Hawaii. Amy Greenwell, who has been working at the Garden on Hawaiian Botany in collaboration with Otto Degener during the past year, returned in August to her home in Honolulu.

Lectures. Dr. P. P. Pirone addressed the annual meeting of the American Rose Society at Williamsburg, Va., Sept. 26 on "Disease and Insect Control on Roses."

Dr. E. E. Naylor showed "The Gift of Green" and gave a short talk Aug. 21 before the Lime Rock Garden Club at the home of Joseph R. Swan, President of the New York Botanical Garden, at Salisbury, Conn.

On July 23 Dr. W. H. Camp lectured before the Southampton Garden Club on the subject of exploration.

Dr. A. B. Stout gave an illustrated talk on "Daylilies in the Home Garden" July 31 at Amherst, Mass., on the Farm and Home Days program of the University of Massachusetts.

Elizabeth C. Hall spoke on "Garden Books" at the School of Horticulture, Ambler, Pa., July 8.

Dr. H. N. Moldenke lectured June 18 on "Marvels in Adaptation among our Local Plants" to the Philipstown (N. Y.) Garden Club at West Point.

Groups. Among the groups that have toured the grounds of the Garden recently have been members of the Woman's Club of Woodridge, N. J.; pupils from the Norwich (Conn.) public school; Garden Club members from Bernardsville, N. J., and 45 student nurses from the Columbia-Presbyterian Medical Center. Fifteen biology graduates of New York University, under Elwood Winters, visited the plant physiology laboratory July 31 and afterward saw "The Gift of Green" in the Lecture Hall.

Visitors. Dr. G. W. Martin of the University of Iowa came to New York with Mrs. Martin during the middle of the summer to complete his manuscript on the Myxomycetes for *North American Flora.* He received a month's scholarship from the New York Botanical Garden.

Dr. S. F. Blake of the United States Department of Agriculture, Beltsville, Md., spent the second week of September at the Garden working on the concluding volume of his "Geographical Guide to Floras of the World," being published by the U.S.D.A.

Morton and Bodol Lange, mycologist and bryologist, respectively, from the Botanical Laboratory, University of Copenhagen, Denmark, spent the day at the Garden Aug. 28. During the summer, Mr. and Mrs. Lange studied at the Uni-

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versity of Michigan Biological Field Station and were on their way back to Europe when they stopped in New York.

D. A. Timmerman, Director of the Ryks Institut van de Volksgerundheid (State Institute of Public Health), Utrecht, Holland, who was in New York for a meeting of the World Health Organization, visited the Garden Aug. 6.

Charles A. Taylor, Jr., a graduate student at Cornell University, worked on grasses at the Garden for two weeks in August.

Among others who have been at the Garden during the summer months are Pompilio Ortega, Director General of Agriculture, Tegucigalpa, Honduras; Hugo Oswald, Royal Agricultural College, Uppsala, Sweden; Brother Alain, Colegio de la Salle, Vedado, Havana, Cuba; Paul Larsen, Copenhagen, Denmark; L. D. Pryor, Department of the Interior, Canberra, Australia; Duncan A. McLarty, University of Western Ontario, London, Canada; Jason R. Swallen, U. S. National Herbarium, Washington, D. C.; Edgar T. Wherry, University of Pennsylvania; Lincoln Constance, University of California at Berkeley; Anna E. Jenkins, U. S. Department of Agriculture, Washington, D. C.; Ildefonso Vivos M. and Mario Sánchez, Masaya, Nicaragua; Neil Hotchkiss, Fish & Wildlife Service, Laurel, Md.; Hiden T. Cox, Agnes Scott College, Decatur, Ill., with Mrs. Cox; Stanley J. Smith, New York State Museum, Albany; Robert T. Clausen, Cornell; Mrs. L. P. McConnell, Long Island Agricultural & Technical Institute, Farmingdale; M. A. Chrysler, New Brunswick; Margaret Fulford, University of Cincinnati; Laura A. Kolk, Brooklyn College; Mathilde Bensaude Gotz, plant pathologist, recently returned from Portugal; Richard H. Goodwin, New London, Conn.; Ernest Hemming, former editor of *American Nurseryman,* now one of the owners of Eastern Shore Nurseries, Easton, Md.; Naomi Mullendore, Franklin College, Franklin, Ind.; John Francis McDermott, Washington University, St. Louis, Mo.; Dow V. Baxter, School of Forestry, Ann Arbor, Mich.; Cecil H. Williams, British Guiana; Hugo G. di Michele, University of Maryland; Judith Embury, former volunteer worker

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in plant pathology; George A. Llano, lichenologist, with Mrs. Llano, of Weymouth, Mass., recently a nature guide at Mt. Desert Island, Maine; Jeannette E. Graustein, University of Delaware; W. Lawrence White and Mary H. Droning, Biological Laboratory, Philadelphia; Joyce Osborn, Wellington, New Zealand; Elizabeth A. Valentine, University of Pennsylvania; M. J. Thirumalachar, Department of Plant Pathology, University of Wisconsin; and S. C. Damon, Brown University, Providence, R. I.

Journey to Japan

INVITED by the War Department at the request of General Douglas MacArthur, Dr. William J. Robbins was one of a group of six scientists from the United States to spend 40 days in Japan during the summer for a survey of the plans for reconstruction of Japan's scientific institutions. The task assigned to the group was to advise members of General MacArthur's staff on the democratization of scientific research, weighing the plans submitted by Japanese scientific societies.

The group, appointed by the National Academy of Sciences, was headed by Dr. Roger Adams, Professor of Chemistry at the University of Illinois. Others in the party were, besides Dr. Robbins: Dr. Merrill K. Bennett, Executive Director of the Food Research Institute of Stanford University; Dr. William D. Coolidge, Director Emeritus of Research of the General Electric Company; Dr. William V. Houston, President of the Rice Institute, and Dr. Royal W. Sorensen, Professor of Electrical Engineering at the California Institute of Technology.

The scientific party arrived in Tokyo by plane from San Francisco July 19. The first eleven days were devoted to orientation and discussion of plans with Japanese scientists and organizers. Trips were subsequently made to Kyoto, Osaka, Nara, Hiroshima, Fukuoka, and Sendai. The last portion of the period in Japan was spent in Tokyo, with conferences and farewell visits. An 80-page report submitted to the War Department through the National Academy of Sciences contains the recommendations of the six scientific advisors.

In order to get a picture of Japanese life, beyond what was presented through the daily conferences with university professors and scientists, Dr. Robbins visited Japanese villages and farms.

He inspected also one of the hydroponics farms where vegetables are raised in water culture for the American forces, the famous Buddhist and Shinto shrines at Nikko, Nara, and Miyajima, and the naval base at Kure. Dr. Robbins made a journey to the Botanical Garden at. Nogya, also to the one at Nikko, which was the subject of a descriptive article by B. C. Blackburn in the Journal for January, 1947. At his home in the suburbs of Tokyo, he spent an afternoon with Dr. Tomitaro Makino, now 84, the oldest living Japanese botanist, widely known for his systematic studies of the flora of Japan. Dr. Makino has a herbarium of 500,000 specimens.

Back from Polar Regions

RETURNING to New York after a summer's trip to the Arctic in the schooner *Bowdoin,* in company with Donald B. MacMillan, Rutherford Platt stopped at the New York Botanical Garden Sept. 22, bringing with him nearly 5,000 herbarium specimens, representing 460 sheets of boreal plants, some collected from places which have never before been botanically explored. Assisted by Arthur J. Boucot, he collected plants at 38 stations—14 in Labrador, up to the north tip at Cape Chidley; 18 in Greenland, mostly north of Melville Bay; 4 in Baffinland, including the Savage Islands northeast of Frobisher Bay; and on the two Polar islands of Hakluyt and Carey.

The expedition, which left the United States in June, traveled as far north as was humanly possible at the time of year, reaching within 11 degrees of the North Pole, and turning back only when stopped by an impassable ice barrier in Kane Basin. In the round trip, 8,000 miles were covered. In addition to herbarium specimens, Mr. Platt has also brought back 2,500 kodachromes and 1,500 black and white photographs.

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THE NEW YORK BOTANICAL GARDEN
and what it means

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* * * *

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* * * *

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OF

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VOL. 48 NOVEMBER PAGES

No. 575 1947 245-268

JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

NOVEMBER EVENTS AT THE GARDEN

Members' Day

Nov. 5 at 3 p.m. in the Lecture Hall

The Present Status of the Dutch Elm Disease — *P. P. Pirone*, Plant Pathologist

Free Saturday Programs

3 p.m. in the Lecture Hall

Nov. 8	***Plants to Grow Inside of City Windows***	*Jean Hersey*, Gardener-Writer
Nov. 15	***Caribbean Stepping Stones***	*R. A. Howard*, Assistant Curator
Nov. 22	***Trees in the Winter Landscape***	*E. J. Alexander*, Associate Curator
Nov. 29	***Putting the Garden to Bed***	*R. R. Fenska*, Bartlett Tree Research Laboratories
Dec. 6	***Plant Food from Coal and Magic of Coal***	Two motion picture films with sound

Radio Programs

"Calling All Gardeners" every Saturday morning from 8:30 to 8:45, over WNYC, 830 on the dial.

Museum Exhibits

British Gardens Through the Ages

150 fine photographs on view through the courtesy of "My Garden" magazine of London, showing historical, formal, royal, rock and water gardens, lawns and borders, landscape and wild gardens, trees, and gardens of today. The exhibit will continue through November.

Conservatory Displays

Seasonal flower displays will be resumed with an exhibit of chrysanthemums in the Conservatory commencing Nov. 1.

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VOL. 48 NOVEMBER 1947 NO. 575

Do You Collect Pollen?

The Reasons Why Others Gather and Study It Given in a Survey of the Newly Named Science of Palynology

By G. Erdtman

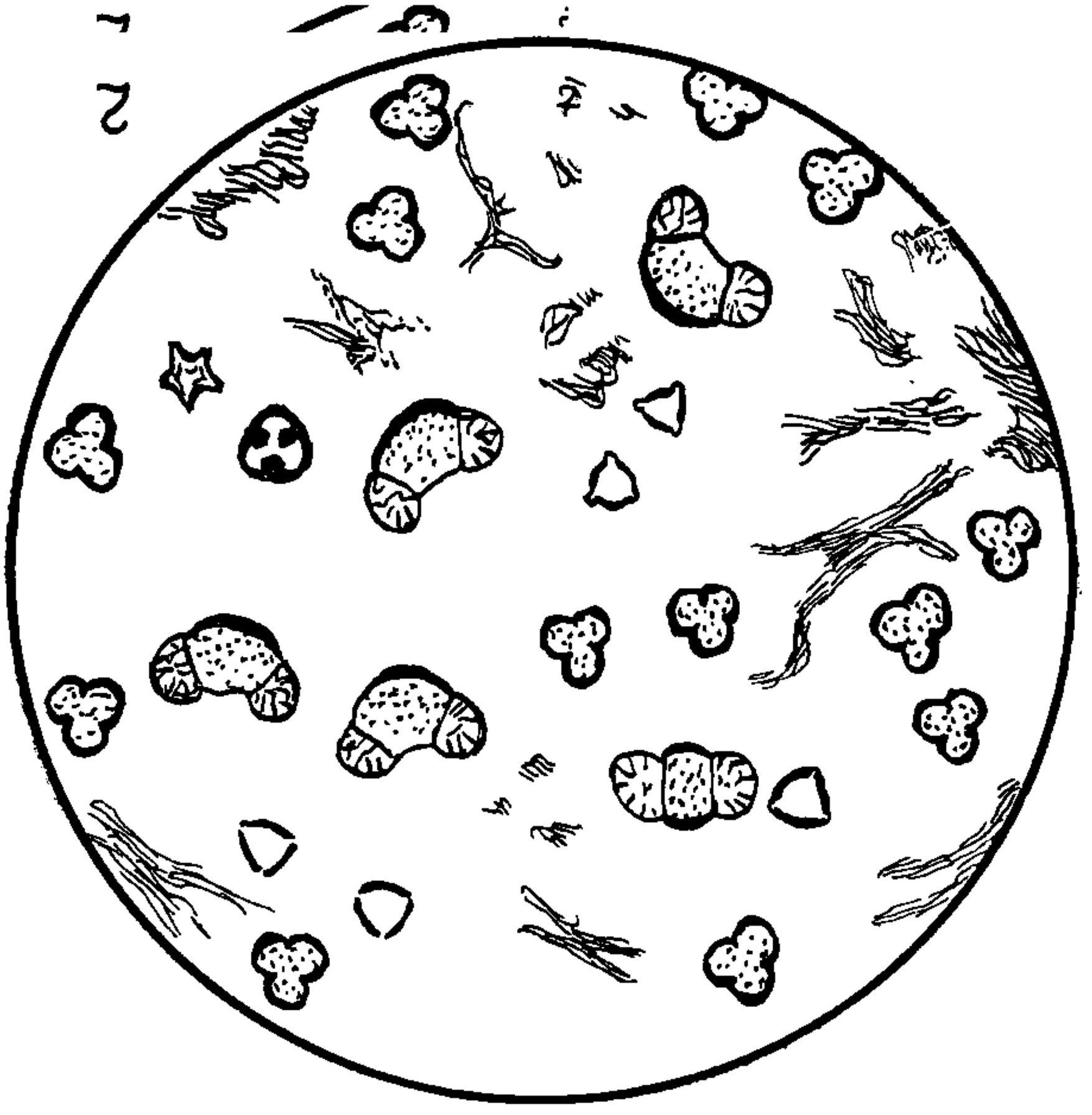
COLLECTING POLLEN—of what possible use can that be? It sounds like a rather odd way of wasting time. And in any event, *how* does one collect pollen and *why?*

Botanically, pollen is highly interesting and significant. Pollens of many plants are widespread in the air, and are also found deep in the soil and in the beds of the oceans, telling the story of plant life through millions of years. Surveys of pollen in the atmosphere are made by many ingenious methods, including trapping the tiny grains on greased plates or by means of filters through which air is sucked by vacuum. Airplanes and powerful borers are employed in the search for pollen above and below the surface of the earth. The study of pollen grains is a fascinating one, and has made valuable contributions toward the solving of problems in archaeology, geology, medicine, and other sciences.

A new term PALYNOLOGY (research into pollen grains and spores), has been coined from the Greek to cover this new field of scientific activity. A palynologist must be ready to answer almost any question relating to pollens and spores, whether the question is put by a plant systematist, a peat geologist, a doctor, a meteorologist, or a member of the exclusive guild of palaeomelitologists, looking for pollen in ancient honeys from Egyptian tombs or in the dry remains of mead which may occur in old drinking horns. Some of the different aspects of palynological studies are described briefly below.

* * *

The teeming field of study known as pollen statistics (or pollen analysis) belongs logically to the sphere of palynology. A prospective pollen statis-



tician may aptly start his career collecting pollen grains from trees and studying them for purposes of identification. This being done, he may proceed to studies of the pollen grains contained in the surface layers ot bogs—Nature's own archives of forest history—and the way in which they reflect the composition of forests. This is necessary for the correct interpretation of the fossil pollen grains, which continue to be identifiable in the deeper layers (representing successively older bog surfaces), although the plants forming the bulk of the peat may be altered out of all recognition.

Such in briefest outline is the succession of preparatory studies which may make the microscopical records of the "forest archives" comparatively easy to read. The pollen grains in these archives may also provide information of interest in connections other than forest history—such as in questions relating to the development of climate.

A pollen statistician with true palynological aspirations does not restrict himself to studies of forest tree pollens. Having once obtained a wider palynological knowledge, he will be able in districts once totally covered by ice to identify pollen grains of the herb and shrub pioneers and vagabonds which spread in the wake of the retreating glacier. He will, likewise, be able to trace the history of heaths and prairies, and to follow the history of agriculture as reflected in pollen grains of weeds and cultivated grasses.

His investigations need not be confined to bogs. Pollen grains preserved in certain forest soils may indicate shifts from deciduous forests to coniferous, or *vice versa*. Grains embedded in lake sediments or in the ice of glaciers may provide information as to the history of the lakes or

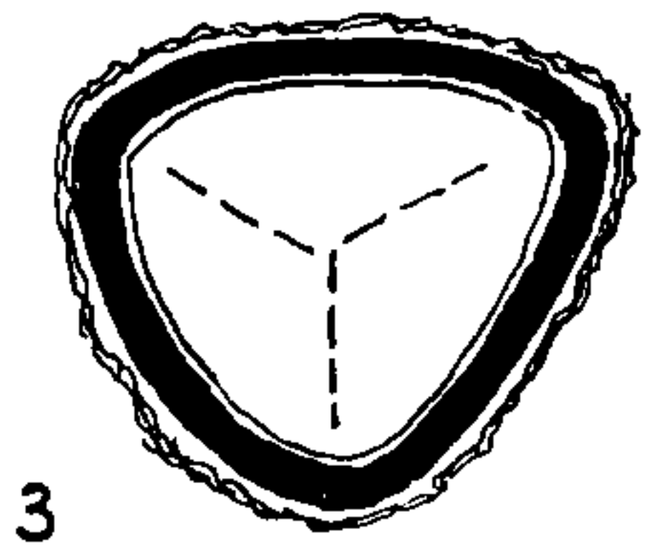
(*On the opposite page*)

POLLEN GRAINS FROM A MUSKEG IN MINNESOTA

Schematic drawings of two visual fields under the microscope. The specimens were collected near Twin Lakes, in Itasca State Park.

Fig. 1: Pollen grains from the surface layer. The peat has been subjected to various chemical treatments (chlorination, acetolysis) which have dissolved away the peat leaving only the pollen grains and a few fragments of particularly resistant debris. In the field of vision are seen 20 pollen grains of pine, two of birch, and one each of alder (pentagonal), spruce (similar to pine pollen but larger), and tamarack (circular).

Fig. 2: Pollen grains from a layer about fourteen feet under the surface, formed probably several thousand years ago when oak forests and other deciduous trees were far more abundant than now. As in the figure above, 25 pollen grains are shown: 13 from oak, 5 from pine, 2 each from birch and hazel, one from blue beech (upper left side), and one each from linden and alder (lower right side).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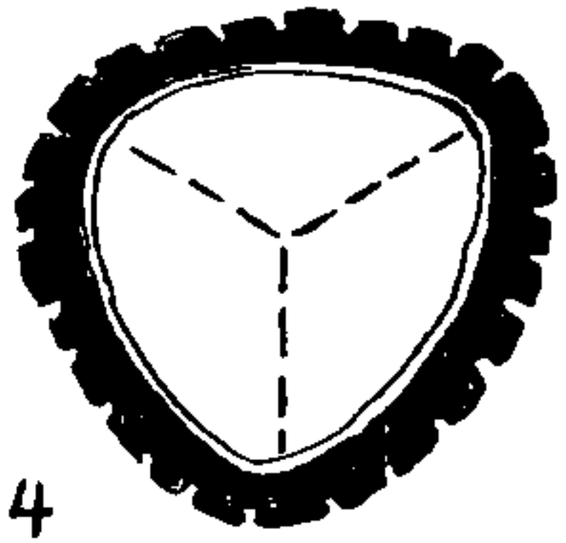
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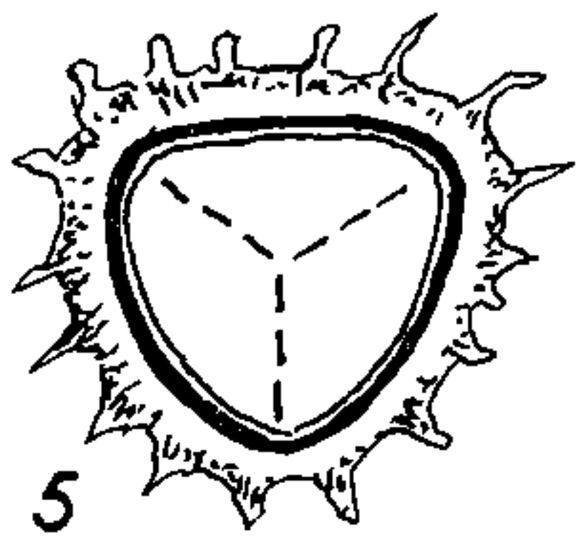
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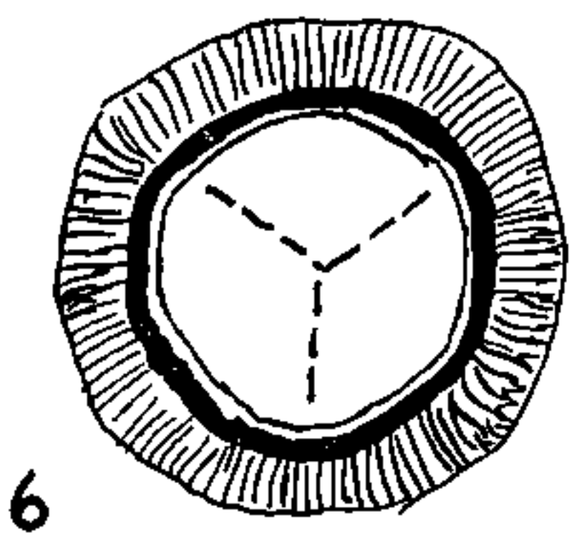
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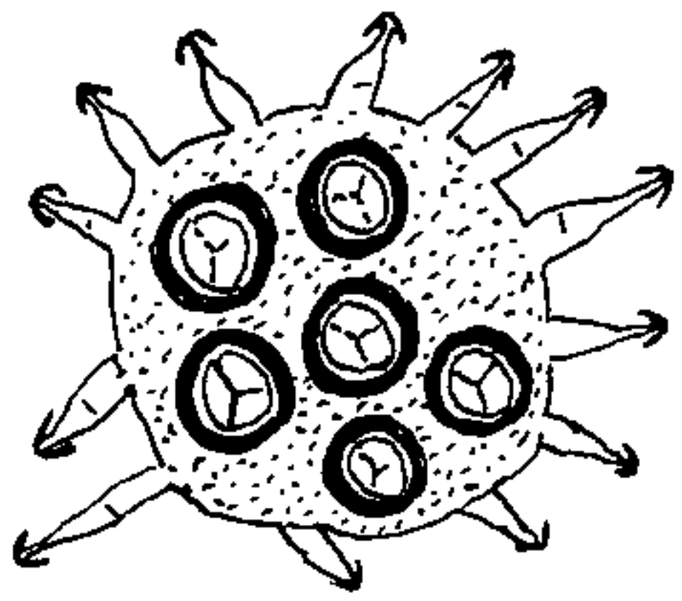
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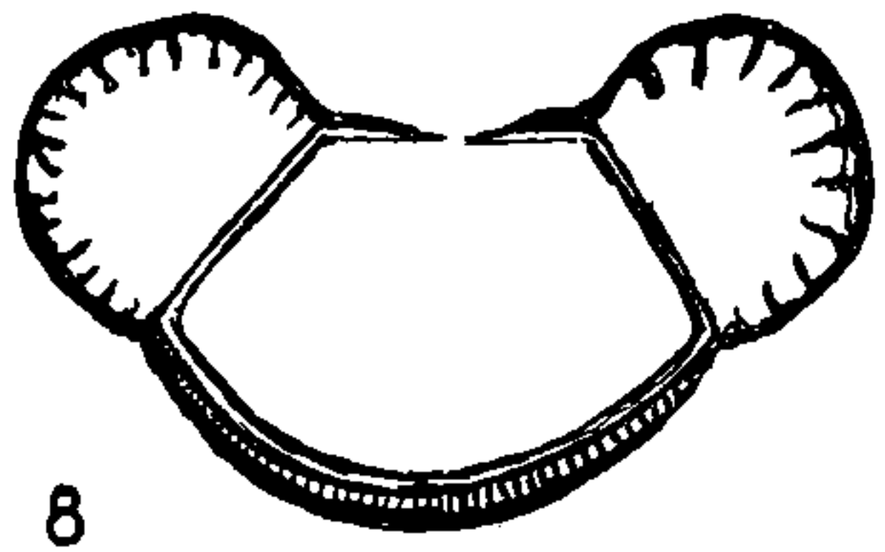
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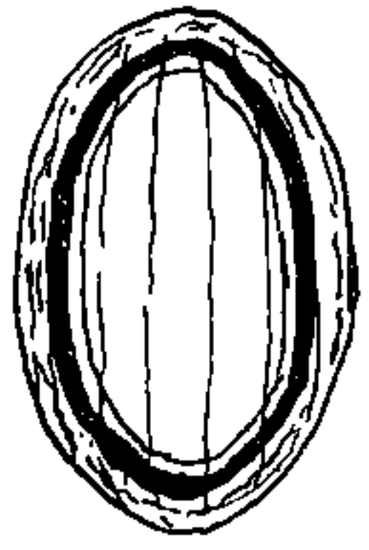
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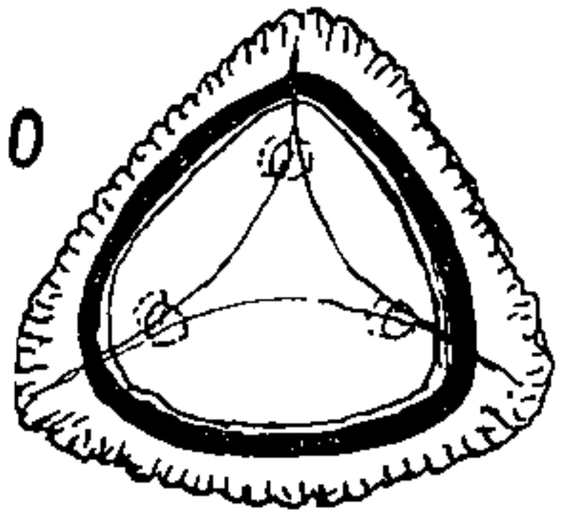
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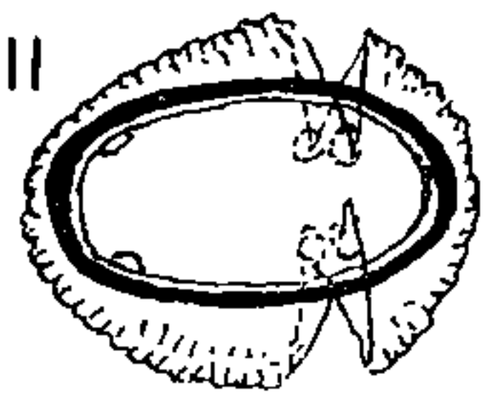
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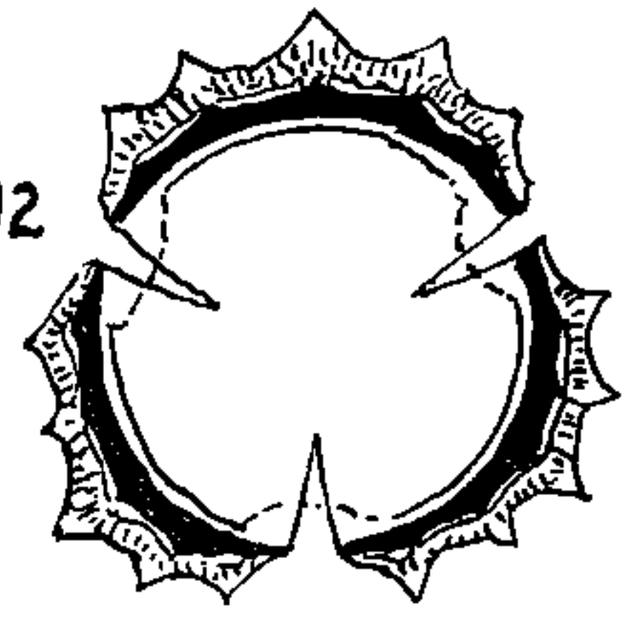
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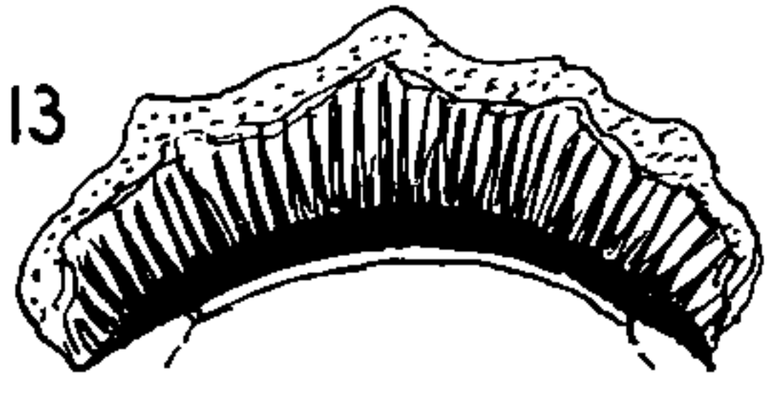
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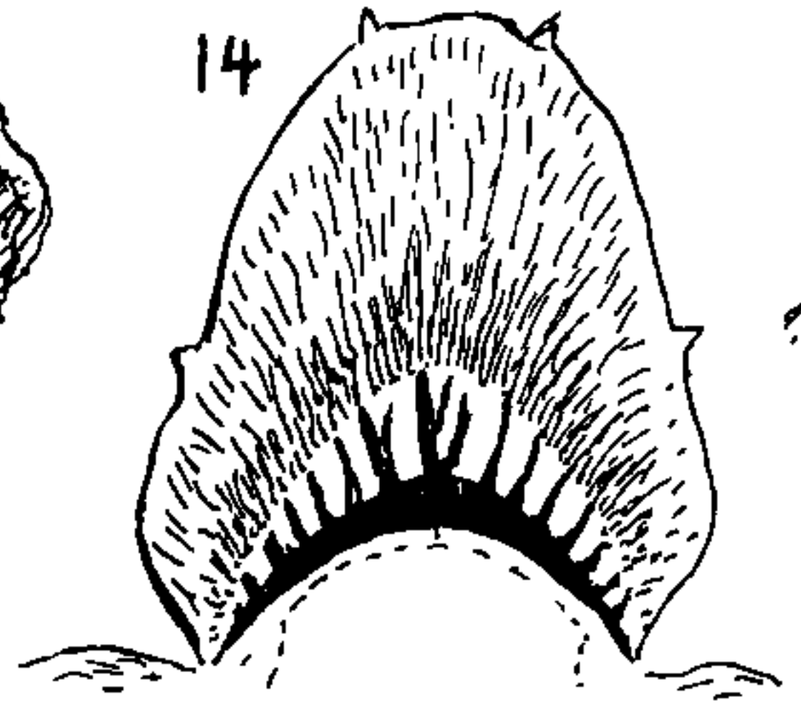
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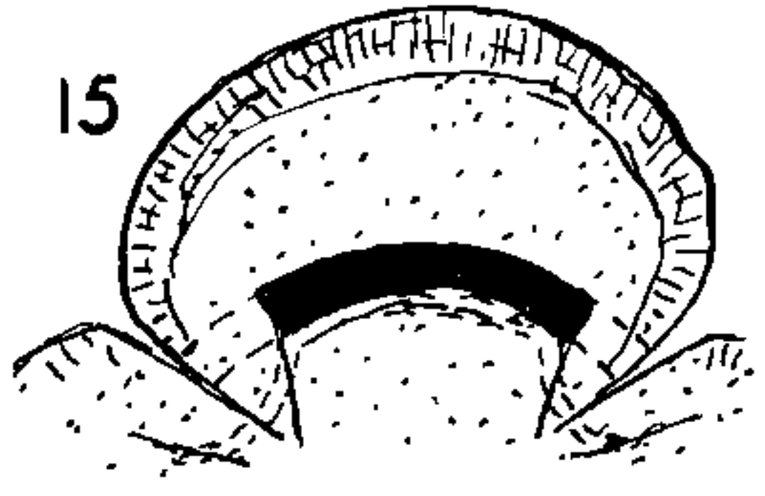
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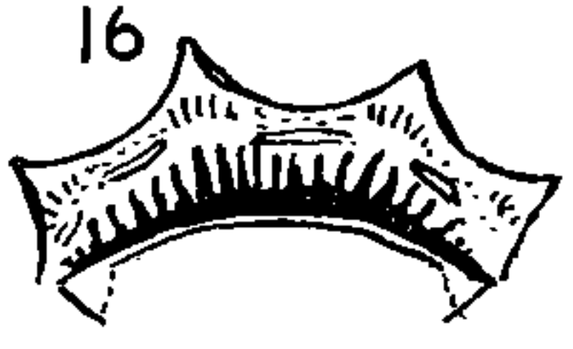
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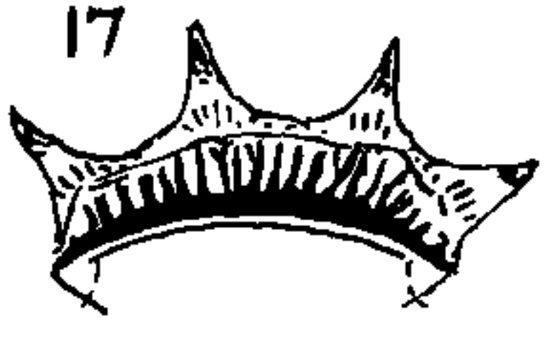
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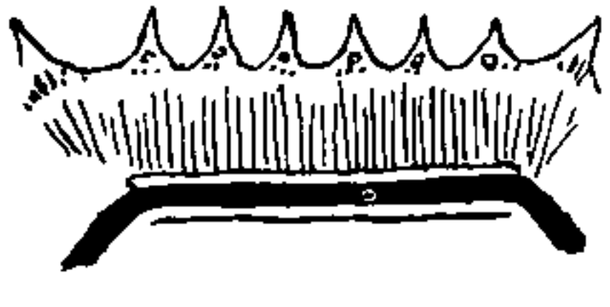
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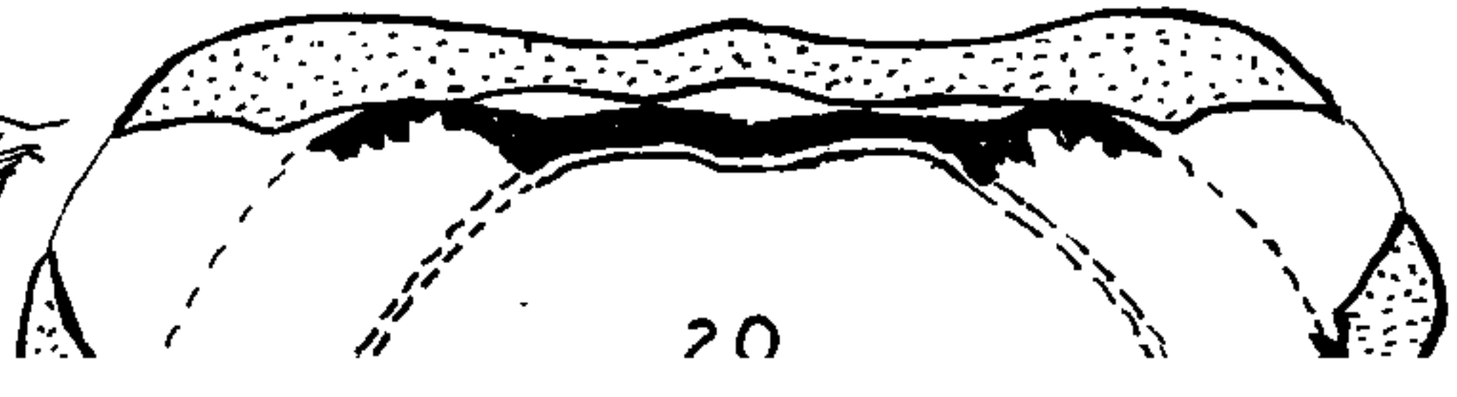
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the rate at which the ice is formed and how it moves. (Winds, by the way, sometimes carry pollen for much longer distances than to neighboring bogs, lakes, and glaciers. Although they are rather large, pine and spruce grains from the American continent are known to have been blown as far afield as Greenland. Pollen grains have even been trapped in mid-ocean between Newfoundland and Ireland.)

Pollen grains have also been found in deep-sea cores—collected in 1946 by an expedition led by Professor Hans Pettersson of Gothenburg—from the bed of the western Mediterranean between Naples and Sardinia. The preliminary results achieved by this expedition hint at the interesting possibility of our being able to unravel the vegetational history of countries covered by desert, savannah, or tropical forest, and destitute of bogs, by investigation of the pollen in submarine layers at the bottom of adjoining seas. And what will the ocean-buried pollen grains, provided they can be made to yield up their secrets, tell us about the vegetation in interglacial times and still more remote ages?

We must wait and see. In the meantime, ambitious palynologists could probably do no better than collect pollen grains of as many species as possible and see that they are properly described and classified. This involves a tremendous amount of work which should be carefully planned, centralized, and co-ordinated. In this way an adequate foundation for further research would be laid down.

One of the most fascinating problems facing the palynologist is: "When did flowering plants make their first appearance?" Pollen grains, which

(On the opposite page)

WALL CONSTRUCTION IN SOME SPORES AND POLLEN GRAINS

The ektexine is marked by full black; outside of it is the perine (if present); inside of it is the thin endexine. These are all schematically represented.

Figs. 3-7: Trilete spores (with a three-slit opening) in *Sphagnum cuspidatum* (3); *Phylloglossum* (4); *Selaginella selaginoides* (5); *Marsilea* (6); and *Azolla* (7). The spores in *Phylloglossum* have no perine, while in *Azolla* several spores (microspores) are enclosed in a common perine.

Figs. 8-20: Pollen grains in pine (8), in which the two air-sacs are separated from the interior of the grain by endexine; *Ephedra* (9); *Neurada*, a rare African member of the Rose family (10); the plumeless thistle, *Carduus acanthoides* (12); burdock, *Arctium minus* (13); the globe thistle, *Echinops sphaerocephalus* (14); *Centaurea scabiosa* (15); the common field daisy, *Chrysanthemum leucanthemum* (16); the corn-marigold, *C. segetum* (17); chicory, *Cichorium intybus* (18); *Serratula tinctoria*, also of the Composite family (19); and *Clarkia* (*Eucharidium*) *concinna*, known as "red ribbons" (20).

Figs. 13-20 are fragmental; the fragments shown in figs. 13-17 and 20 correspond to the upper part of fig. 12.

could not be distinguished from those of modern walnut trees, have been found in Jurassic beds in the south of England. Assuming that these pollen grains really came from plants belonging to the walnut family, and particularly if the botanists are right who believe that the walnut family is not a very primitive one, then the history of the flowering plants proper, the angiosperms, probably stretches much further back than is often supposed.

Palynology touches medicine in hayfever and similar research. Here, several methods of calculating the absolute amount of pollen grains suspended in the air have been developed. A method of trapping grains by sucking air through filters was developed in Sweden, and later fully tested in Norway by Dr. O. Andrup. From his book "Hay Fever in Norway"* may be seen, for instance, that people sensitive to grass pollens had a relatively good day in Oslo on July 4, 1941, the number of grass pollen grains per 100 cubic meters of air then being only about 400. Two days later, however, their condition was much worse as the air was thick with grass pollen—about 41,000 per 100 cubic meters of air. Dr. Andrup's book also contains interesting diagrams showing the relation between atmospheric pollen-content, rainfall, temperature, the symptoms of untreated hayfever patients, and the course of hayfever in patients treated prophylactically.

In studies of honey and drugs, palynology touches pharmacology. Pollen investigations may, at times, reveal dishonest practices: for example, a supposed New England honey containing an abundance of pollen grains of Bombacaceae and other exotic plants may readily be shown to be of Mexican origin.

* * *

The first and foremost importance of palynology from a strictly botanical point of view has not yet been dealt with here—namely, the use of pollen grain characteristics in answering questions such as: "Which plants are most closely related to the palm family, which to the grasses, which to the composites? Should the composites really form only one family, or would it be better to split them up into several smaller units?"

In approaching so complex a problem we shall restrict ourselves to considering a few features in the higher plants—namely, mosses, ferns, and seed plants. The shape and inner construction of these plants may vary within wide limits according to climatic and other conditions. A parasite often looks quite different from a nonparasitic relative. Many desert plants are superficially similar although they may belong to different families. The spores of mosses and ferns and the pollen grains of the seed plants are, on the other hand, invariably formed in the same way within special mother cells, irrespective of climatic and other conditions. Each of these mothers has quadruplets—that is the spores are formed in

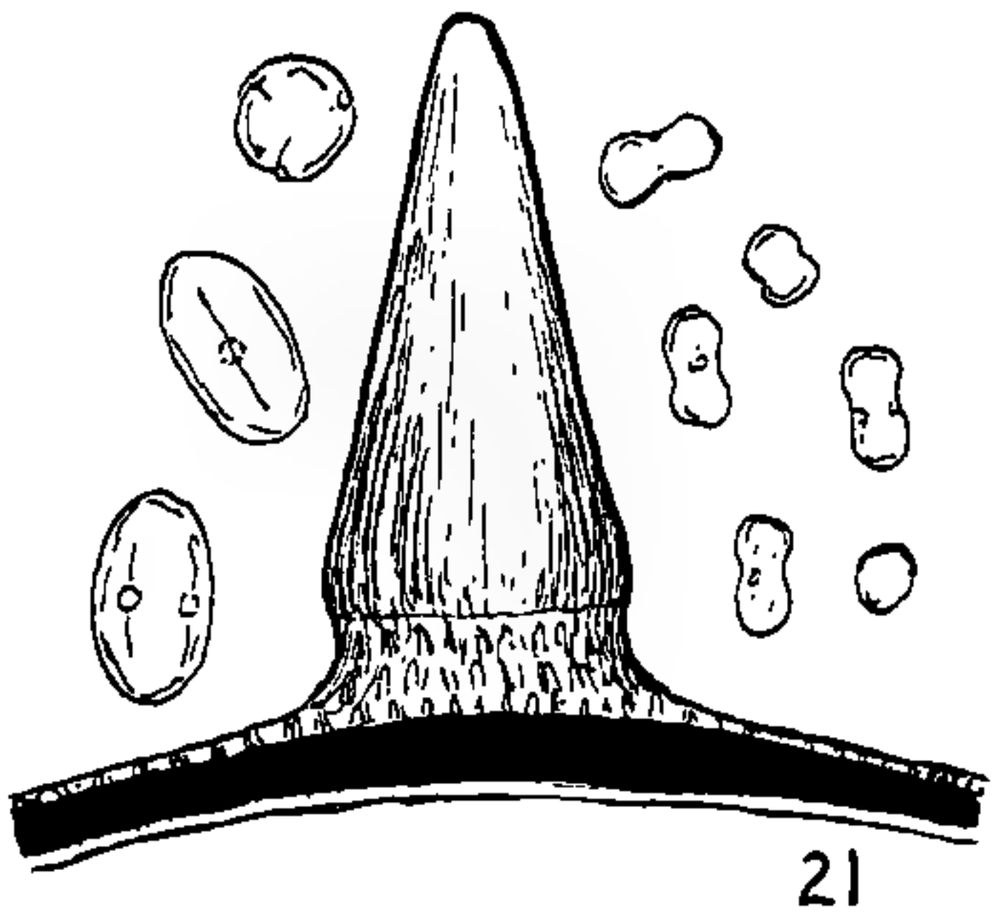
* Norske Vid.-Ak. Skr., Mat.-nat. Kl., No. 5. Oslo, 1945.

fours (the term spores implies here, and subsequently, according to the context, both pollen grains and spores). Since they are engendered by small cells, the spores must be very small themselves. Their diameter is usually between 25 and 50 microns, the maximum and minimum figures being about 250 and 5 microns, respectively. Considering the uniform mode of spore formation, it would be natural to expect spores to be constructed along similar lines all the way from the moss spores right up to the pollen grains of the most advanced plants.

Figures 3-20 show that this really is the situation. In these drawings, the spores are not shown in their entirety, but only their walls, for these, in the eye of a palynologist, are the most interesting part of their structure.

The spore wall proper usually exhibits several layers. The outermost layer, or PERINE, is—if present at all—arranged more or less loosely as a wavy, warty, spiny, or smooth layer outside the part of the wall known as the EXINE. In horsetail spores (*Equisetum*) a part of the perine is split up into two spiral bands (amplectors or embracers), which in damp weather are twisted tightly around the exine. In thistle pollen (fig. 12) the perine presents a more or less thorny appearance, while in chicory (fig. 18), hawk's-beard, and common sow-thistle it is thrown into ridges with small spines on their crests.

The exine forms the main part of the spore wall proper. It is often divided into two layers. The outer of these, the EKTEXINE, is relatively thick and usually provided with sculpturing of some kind. The inner layer, the ENDEXINE, is thin, smooth, and highly refractive. The pollen tubes are formed by the INTINE, a layer intercalated between the spore wall proper and the protoplasm in the interior of the spore. Intine and protoplasm are chiefly studied by physiologists and cytologists.



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A GIANT AND SOME DWARFS

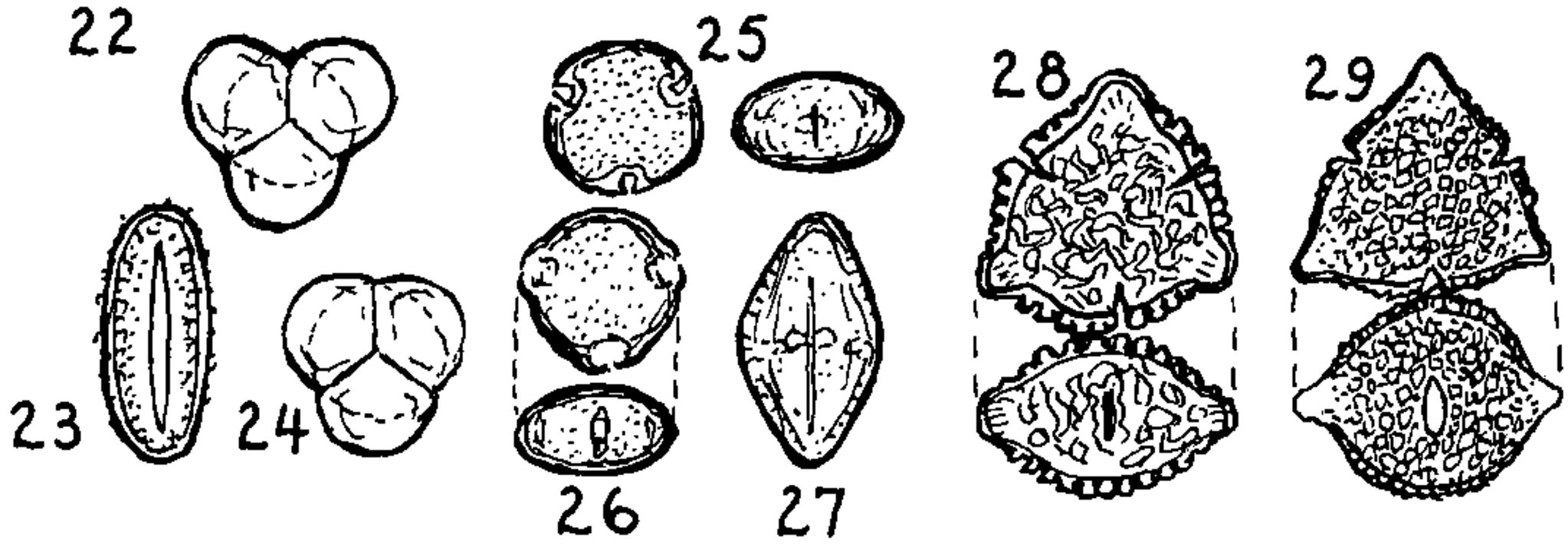
The dwarfs among these pollen grains received from the New York Botanical Garden are represented by the navelwort, *Omphalodes verna* (to the left; size about 9.5 x 6 microns) and the forget-me-not, *Myosotis silvatica* (to the right; 5.5 x 3.5 microns or slightly less). The giant, *Hibiscus manihot*, is represented by a single spine about 30 microns long. The diameter of the entire pollen grain, spines excluded, measures about 160 microns, or six-thousandths of an inch.

We are often not quite able to analyze confidently all the many details in spore wall construction, and even questions concerning its gross features —as outlined above—are still under debate. In classifying and describing the spores reference is, therefore, often made to evidence furnished by more easily distinguishable characteristics, such as the apertures in the spore walls and the size and shape of the spores themselves. These charac-

teristics are condensed into a spore formula, which may be regarded as a fingerprint, providing a means for provisional classification.

In some families there are many types of "fingerprints," in others—so far as is known (and it should always be remembered that palynology is as yet in its infancy)—few or only one. With a sufficient number of "fingerprints" at his disposal, a palynologist may proceed in a way similar to that followed by the dactyloscopist, the fingerprint expert. If he is asked about the pollen grain characteristics and their bearing in deciding, for instance, whether *Gonystylus*, a Malayan tree genus, should better be referred to the daphne family, Thymelaeaceae, or to a family of its own near the mallows, (systematists have not been able to agree on this point), he may point to the fact that the pollen grains in *Gonystylus* are of the same type as those in Thymelaeaceae, and that this pollen type has never been encountered in the mallow family and its near relatives. In such cases it is, figuratively speaking, in the power of a single pollen grain to weigh down heavily the balance of plant systematics.

Pollen grain arguments have also been instrumental in making such transfers as that of *Diclidanthera*, a South American genus of trees and shrubs hitherto normally referred to sympetalous families, to the milkwort family (Polygalaceae), in which the petals may be either separate or partly united. Pollen grain characteristics are used profusely in the description of members of the acanthus family, and they should be extensively studied in monographical surveys of other large families, such as the daisies and their relatives (Compositae), the spurges (Euphorbiaceae),



POLLEN GRAIN CHARACTERISTICS AND PLANT SYSTEMATICS

Should *Thurnia* (22) be placed in the neighborhood of the Bromeliaceae (23) or in (or near) the Juncaceae (24)? Is it correct to refer *Carpodiptera* (27) to the *Brownlowia* group (26) within Tiliaceae, and to exclude *Tilia* (25) from the same group? Are *Ceiba aesculifolia* (28) and C. *pallida* (29) identical or not? These are some of the taxonomic questions which the palynologist can help to answer.

About the Author

DR. G. ERDTMAN, of Stockholm, is the author of "An Introduction to Pollen Analysis," published as Vol. XII in "A New Series of Plant Science Books" edited by Frans Verdoorn. Dr. Erdtman is largely responsible for introducing British and American scientists to pollen studies as a new means of geological investigation. Between 1919 and 1929 he pursued extensive pollen analytical investigations in Europe, particularly in the countries bordering the North Sea, and in 1930-1931 in America. Since then, recognizing the importance of pollen and spore morphology in plant systematics, he has been dealing chiefly with the theoretical foundations of pollen analysis.

lilies (Liliaceae), and palms (Palmae); also the madder family (Rubiaceae), containing coffee, quinine, and other familiar trees; the Sterculiaceae, which includes chocolate and cola, and many others. Similarly, the spores of the fern family Polypodiaceae should be made a factor in taxonomic research on this group of plants. In other families, of which the mustards and cabbages (Cruciferae), carrots and parsley (Umbelliferae), and the grasses (Gramineae) may be mentioned as examples, they are probably of minor importance.

Pollen grain features and their value in systematic botany thus argue strongly in favor of a suggestion made fourteen years ago by Dr. R. P. Wodehouse, whose work and wide knowledge have been of great value to palynologists. He suggested the introduction of pollen diagnoses in descriptions of new plant species. This, according to Wodehouse, warrants the building up of reference collections of permanently mounted pollen slides as additions to our herbaria. International co-operation, effectively organized, is essential if this is to be realized.

With palynological laboratories duly established, the title of this paper: "Do you collect pollen?" would perhaps be a common question. And it is certain that many of the problems centered in these tiny pollen grains are important not only scientifically but also, and particularly in the long run, from an economic point of view. Palynologists will be able to make interesting disclosures, whether they gather their material from the quaking bogs of Ireland or the frozen soils of Alaska, from the laminated clays of ancient Lake Agassiz or the sediments of the Caribbean Sea, from Swiss air, Californian honey, Baltic amber, or the tropical ice lingering in the crater of Mount Kilimandjaro; or simply from the interior of the stamens of the many plants, the systematic position of which is still obscure.

The Sycomore Fig Of Ancient Lineage

By Mary F. Barrett

IN the Bible, the most familiar of the collections of ancient literature, the "fig-tree" is that best known species of *Ficus, F. carica.* But the Old Testament mentions also another tree of that genus, which grew in the low-lands and furnished both wood and figs. To this, the great botanist Linnaeus in 1753 gave as a specific name its ancient title, *sycomorus.*

It was one of these short-trunked trees which Zacchaeus was said to have climbed in order to see Jesus as he passed through Jericho (St. Luke **19**: 4). Although often misspelled *sycamorus* and *sycamore,* it is, of course, not related to the buttonwood and the plane trees (*Platanus*), which often go by that name, or to the sycamore maple (*Acer pscudo-platanus*). These "sycamores" doubtless received that title because of their resemblance to *F. sycomorus* in such characters as rounded crown, light-colored and scaly trunk, and broad, palmately veined leaves.[1] However, the woody fruit-balls of *Platanus* and the keys of the sycamore maple are very different from the figs of *Ficus* and prove that no real relationship exists.

The figs grow in clusters on leafless twigs from the trunk and lower branches; rarely from the axils of the leaves. The flowers, within the receptacles (figs), are pollinated by insects which enter through the ostiole, the small opening at the apex of the fig. These insects then are unable to make their escape until the apex is cut off with a knife. Later the outside of the fig is scored lengthwise by a metal spike attached to a sort of thimble on the finger of a person who, like the prophet Amos, will "tend sycomores" (Amos 7: 14, Moffatt edition). Only then does the receptacle attain its full size of an inch or more in its greatest diameter. The figs are globose or obovoid and show some red or green on their hairy outer surface. The base of the receptacle is narrowed into a stalk or is sessile above two or three downy basal bracts. Below the bracts the pubescent peduncle is about half the length of the rest of the fig.

Sycomore figs are produced throughout the year in their native or naturalized homes, but are most abundant at two or three times in the twelve months.

Trees of *F. sycomorus* may reach a height of 60 feet, and may produce a crown 45 feet in diameter. Such trees would shade the entire width of a street even if planted on only one side. An example of similar, although smaller, trees is to be seen in the avenue of sycomores at Chapman Field, the Plant Introduction Station of the United States Department of Agriculture, located south of Miami, Florida.

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[1] See the note by H. W. Rickett on page 262.

Antiquity of Fig-trees

Ficus carica and *F. sycomorus* are the most ancient species of their genus in the sense that they became well known before any of the others. The common fig, *F. carica,* a rather small tree, may have originated in Asia Minor, but from the earliest days was widely planted for its fruits. *F. sycomorus* probably was native to Yemen and to Eritrea, on opposite sides of the Red Sea, but early spread to Egypt and other parts of northern Africa, to Palestine and near-by regions, and to some of the Mediterranean islands. At present it is found almost throughout Africa, and is cultivated in other tropical and subtropical climates. Its figs, although less palatable than those of *F. carica,* were used by the ancients for food and medicine, its wood was prized by the Egyptians for mummy cases and by the Jews for building, and its shady crowns were a luxury in a city of sun-baked streets.

The antiquity of the sycomore is shown by Egyptian paintings dating back to the Fifth Dynasty, some of them showing the gathering of the fruit; by the 5000-year-old Sheik-al-Balad statute in Cairo, carved from sycomore wood; in the leafy branches which were placed in sarcophagi,

In ancient Egypt the sycomore fig was often held sacred by the people. The early picture shown here (reproduced in "A History of Garden Art" by Marie Luise Gothein) shows a peasant doing honor to a sycomore tree by sacrificing to it the fruits of the earth.

The sycomore fig is an important tree in Egypt today, as it was in ancient times. The picture above (taken from Karsten & Schenck, "Vegetationsbilder") shows a group of trees in the village square in the capital city of Nubia.

and in legends connected with the tree. This was the "Tree of Life" of the ancient Egyptians, and in certain cities was sacred and said to be protected by Isis and Hathor. The species was known also as "Adam's Fig"—a name more valuable for its suggestion of antiquity than for its historical accuracy, especially since the same title has been applied to the banana. Later, a tree in the Coptic Garden at the ancient Heliopolis was designated as the one under which the Holy Family rested during their flight into Egypt.

Early Names for the Sycomore Fig

In the course of centuries both the common fig, which is highly variable, and the sycomore fig, a more nearly static species, acquired many names, in the belief that more than one species of each existed. For *F. sycomorus*, however, only two distinct forms were generally recognized: one for the tree known in Egypt and the second for the form that was found in Crete and Cyprus. The first authoritative description for these two ancient forms is credited to Theophrastus, who lived in the fourth century B.C. In his history of plants as edited in 1644 by Bodaeus à Stapel and others, the parallel Latin translation of his original Greek text bears the heading *De*

moro aegyptia, ficu Cypria . . . , morus, the mulberry, and *ficus,* the fig, being the Latin equivalents of the Greek words used by Theophrastus for these two trees. These are usually transliterated as *sykaminos* [2] (for mulberry) and *sykos*[2] (for fig). Theophrastus therefore believed that the Egyptian tree was a mulberry,[3] although he admitted that the "apple" which grew on the trunk was nearest to a fig in size and appearance and that the tree was very close to the Cyprian fig tree of Crete.[4]

Aulus Cornelius Celsus, born in 25 B.C., distinguished definitely between the two similar names. His work on medicines stated that practitioners put sycamine tears (gum) on the brow of an insane patient to lull him to slumber, but that the mulberry tree, which the Greeks called sycamine, had no tears. Therefore what were referred to were the tears of a tree which grew in Egypt and there was called sycomore.

The allocation of the sycomore to *Ficus* is seen in Pliny's natural history, written about 65 A. D. The specific name cited is *aegyptia* and the author remarks that a similar one is called *Cypria ficus* in Crete.

With Pliny's text the classical period in the history of *F. sycomorus* ended. With the exception of Dioscorides, few other Greek or Roman writers are mentioned in references. Even in the Middle Ages, there are scarcely any allusions to the sycomore.

However, about the middle of the 16th century Mattioli brought this species to the attention of lay as well as scientific readers in his illustrated commentaries on Dioscorides' *De materia medica,* which had been written in the first century A.D.

Mattioli's works were published first in 1554 and were reissued for many years in Italian, French, German, and Bohemian, as well as in Latin. The name cited in the first (Latin) edition for the Egyptian sycomore was *Sycomorus.* This application of the Latin form of the Greek vernacular name has caused Dioscorides to be considered its author. *Ficus cypria* was

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[2] Although these words generally appear in this form, in the original Greek the vowel represented in the first syllable is equivalent to the letter *u* rather than *y*. Thus the Greek words actually were spelled (so far as the two alphabets can be made to coincide), *sukaminos* and *sukos.* When these words are carried over into Latin, the *u* becomes *y* and the *k* becomes *c*; hence we get *Ficus sycomorus* and sycomore in English.

[3] It is possible that this ancient mistake in identification, coupled with the occurrence of the *a* in the second syllable of the Greek *sykaminos,* for mulberry, in combination with *morus,* the Latin word for the mulberry tree, may have led to the common error of using an *a* in place of an *o* in the second syllable of the word sycomore. The correction of the last two syllables of the word may have begun in Strabo's geography. There the author, who had visited Egypt between 25 and 20 B.C., told of the tree called *sykaminos* which produced the fruit *sykomoron*—in English, a mulberry tree which bore fig-mulberries.

[4] In an earlier section of his book, Theophrastus had mentioned *Ficus aegyptia* in connection with *Morus aegyptia*; but the former tree has been identified as *Ceratonia siliqua,* the carob or algarroba.

The early notion that there were two different kinds of sycomore is depicted in this illustration from the Kreutterbuch of 1586, which is the Camerarius edition of the commentaries on Dioscorides by Mattioli (or Matthioli). The plant at the left (1) is the one known in Egypt; that at the right (2), "Ficus cypria," the tree of the islands; the leaf (3) is supposed to represent the type that is common to both forms, having a blade from two to six inches long and almost as wide, the upper surface generally smooth, the lower surface sometimes downy in its early stages. The veining, however, as in all illustrations in this period, is incorrectly drawn. The principal veins are connected by almost straight veinlets, as can be seen in the photograph on the opposite page. Modifications of this woodcut appeared in many other volumes of the period.

Fruiting branch of Ficus sycomorus photographed at Miami, Florida, by the Bureau of Plant Industry, United States Department of Agriculture.

declared to differ from *Sycomorus* in the production of figs from leafless twigs instead of directly from trunk and branches. A woodcut of *Sycomorus* showed serrate leaves, but this mistake was remedied by the time of the Italian edition of 1559. This edition and later ones used vernacular names such as *Sicomoro, Aegyptischer Feigenbaum, Maulbeerfeigen,* etc., thus acknowledging that the sycomore was a fig-tree. As time went on more locations were added to Mattioli's first statement of distribution, and also some popular information and a picture of *F. cypria.*

Late 16th century editions of Mattioli's commentaries and of the works of such writers as d'Aléchamps and John Gerard owed something to the travel writers of the day, who gave evidence in their books that they had at least seen the plants which they mentioned.

Pierre Belon (usually cited as Bellonius), in a French text (1553) had spoken of sycomores cultivated in a garden at Cairo, and there called *Ficus pharaonis.* This book had been made accessible to the scientific world by Clusius (Charles de l'Ecluse), who in 1605 edited it in a Latin translation.

Leonhart Rauwolf (1582) wrote his personal description of a journey to Africa and neighboring countries, which is referred to as *Iter.* In his vivid and somewhat archaic German he described "*Sycomori*" as seen in Tripoli, and also another kind of "*Sycomori*" of which many grew in Cyprus. The first were called "*Aegyptische*" or "*Pharaonische,*" and the second, "*Cypriotische.*" They were "wilde Feugenbaüme," and were called *Mumeitz* by Moors and Arabs. Rauwolf also cited Biblical references. Some of his material was translated in 1693 from "high Dutch" into English by John Ray, who included it in "A collection of curious travels and voyages."

Prospero Alpino in 1592 stated that the sycomore was called *Giumez* in Egypt. He added the legend about the Holy Family, and an illustration.

The names quoted in the five preceding paragraphs formed part of the basis of an orgy of name-making which began before the 17th century and went on until 1753. The perpetrators almost all were systematists, who apparently were unfamiliar with the living sycomore and cared little for anything except its nomenclature. They sometimes quoted long extracts from classic writers, and they always worked over one another's more recent material, and borrowed woodcuts, even the incorrect one with the serrate leaves. Although they realized that at the most two species were involved, they delighted in ringing in all possible changes on the words *Sycomorus, Morus, Ficus, Giumez, Mumeitz,* and others, helped by misspelling and variations in word-endings. If a Latin phrase sounded like a name they pounced upon it for their collection. This period therefore added little to the general information concerning the sycomore, but merely contributed many confusing names.

Even Linnaeus, in 1749, formed the title *Ficus foliis cordatis repandis,*

The huge buttressed trunk of a tree of Ficus sycomorus as it grows in Florida. Clusters of small figs can be seen hanging from the heavy branches. Photograph by Bureau of Plant Industry, U.S.D.A.

fructu sessili. It was not until 1753, when he published his epoch-making "Species Plantarum," that the name *Ficus sycomorus* was finally established to designate the ancient sycomore fig in all its forms.

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How the American Sycamore Acquired Its Name

By H. W. Rickett

WE in the United States call one of our familiar trees the "sycamore" because our forefathers believed in miracles.

It is this way: The medieval church forbade classical drama but gradually substituted for it entertainments of a stronger Christian flavor and moral value. These were the "mysteries" and "miracle plays" which depicted the life and martyrdom of Jesus and of the Saints.

When Zacchaeus, in these miracle plays, had to climb into a tree to see Jesus over the crowd, he used a maple in default of a sycomore (which does not grow wild in Europe). This maple, *Acer pseudoplatanus,* which resembles a sycomore in its dense foliage and grateful shade, is to this day called "sycamore" in England. The change in spelling is not to be wondered at, for spelling was not fixed in early England. Books were few and writers had to use their ingenuity. Chaucer spelled it "sygamour." Perhaps, as Miss Barrett* and others have suggested, the Greek "sukaminos" has influenced the spelling. Possibly our own sycamore (*Platanus occidentalis*) was so named simply because of the resemblance of its maple-shaped leaves to those of the English sycamore.

* See footnote 3 on page 257.

Fine Quality Plants Exhibited At Chrysanthemum Show

Annual Exhibit and Program Bring Nearly 34,000 to Garden

A "QUALITY SHOW" was the characterization given by numerous visitors to the annual exhibit staged at the New York Botanical Garden Oct. 24-26 by the National Chrysanthemum Society.

Fourth in the annals of the organization, this was the third in succession in which the Garden has co-operated by providing space and facilities and presenting a program the afternoon of the opening. The three-day event included, besides the competitive exhibits and the outdoor chrysanthemum displays, the christening of a new variety, a program on chrysanthemum culture in the lecture hall, an exhibit on chrysanthemum pests and diseases and one on the literature of the chrysanthemum, a children's competition, and a tea for members.

Although most chrysanthemums in the region of New York were late in flowering this year, the Garden's outdoor borders of hardy varieties opened up well in time for the show, with promise of even fuller bloom for the following week-end. A border of seedlings contributed by growers attracted attention along the path between the Museum Building and Range I.

Most of the chrysanthemums on display in the Museum Building had been grown outdoors, the majority of them by amateurs with limited yard space, in which they have carried on their own gardening work unaided.

The informal chrysanthemum garden with which the Mamaroneck Garden Club won the tricolor and the Scott trophy for the third successive year.

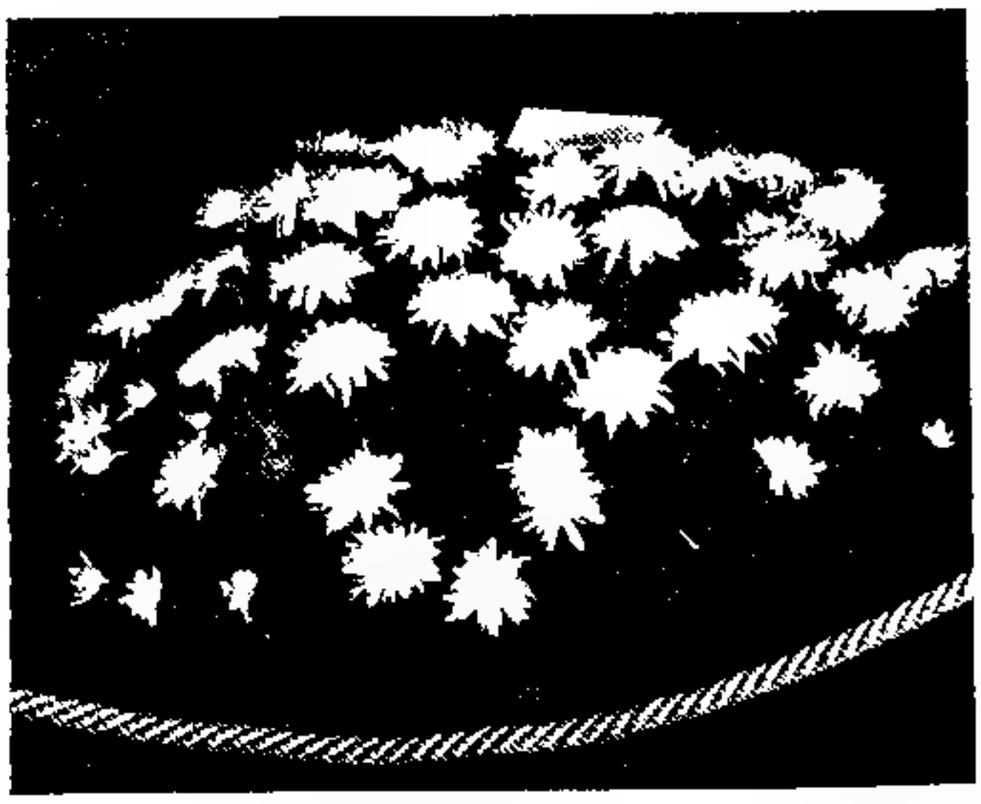
John Gambling (left) receiving from E. L. Bertram a bouquet of the new De Petris chrysanthemum being named for him.

Principal Exhibits

The main floor of the Museum was an indoor garden glowing with the warm colors of chrysanthemums—copper and bronze and rich maroon, gleaming yellow, apricot, rose-purple and pink, offset by purest white, with evergreen backgrounds. Partially encircling the rotunda were three chrysanthemum plantings set up by two commercial planters, Fred Stuber of Yonkers and Golf & Lawn Co. of Rosedale, and the Mamaroneck Garden Club, which for the third time won the Scott trophy for the most artistically arranged planting with fine quality flowers. In the fourth space in the rotunda were two immense potted plants of the white variety "Blanche Pointevine," which was introduced into this country just before the war by Herbert Woodger of Westchester County, and disseminated under the name "England." For this display the New York Botanical Garden was awarded a cultural certificate. Smaller specimens of the same variety banked the balustrade of the stairs. Other large exhibits on the main floor were contributed by Bobbink & Atkins of Rutherford, N. J., and Yoder Brothers of Barberton, Ohio. Mrs. J. Kirchhof of Tenafly, N. J., showed chrysanthemums in a natural garden, and won second prize. Mrs. Spenser H. Capreal of Valhalla, N. Y., displayed cut flowers.

Down the right wing of the building were the exhibits of specimen blooms, with a landscape planting at the far end put up by Dr. and Mrs. E. L. Scott, who were awarded the third prize. The left wing was occupied with the flower arrangements, and these, like the show as a whole, were regarded as of exceptional quality. Arrangements for use on a Thanksgiving buffet, in the living room, as a table centerpiece, on a guest's breakfast tray, on the kitchen window-sill, in the game room, and in other parts of the house carried out the theme of "Chrysanthemums in the Home." By invitation there were also eight shadow box arrangements shown and four Thanksgiving tables set with chrysanthemums for decoration.

Tricolor awards at the show went to Mrs. John W. Roberts of Mamaroneck, N. Y., who won cultural sweepstakes and the ribbon for her collection of cut flowers staged on fifteen square feet; Mrs. H. C. Nye of White Plains, N. Y., for her collection of hardy garden 'mums; Marie T. Leary of Greenwich, Conn., for her collection of sprays of five types of 'mums, the most unusual being "Rose



One of the plants of the white chrysanthemum "Blanche Pointevine" which won a cultural certificate for the New York Botanical Garden.

Madder" disbudded; and Mrs. Blanche Kullgren of Palisades Park, N. J., for a large single "Melba." In the artistic section, the tricolor was given to Mrs. Richard Nathan, New Rochelle, N. Y., for her arrangement of chrysanthemums on a piece of driftwood in combination with sprays of yellow fruit. In winning the tricolor and the Scott trophy for the third year in succession, the Garden Club of Mamaroneck is now permanent owner of the silver cup. The club's exhibit each year was built by Mrs. John C. Germann.

Outstanding among the specimen blooms exhibited were a group of large-flowered varieties flown from California by Lucius R. Bates of Sacramento and an exhibit from Yoder Brothers of Barberton, Ohio, which included a pure white unnamed hardy seedling which excited comment and inquiry from commercial growers, amateur gardeners, and the public alike. Yoder Brothers were given a certificate of culture.

Visitors from Afar

Some of those who attended the show, like some of the flowers exhibited, came from long distances especially for the occasion. Several groups from the Far West had planned their vacations to coincide with this Chrysanthemum Show, and many others made special week-end trips to New York to attend the affair. In addition to the hundreds present at the opening and the thousands more who crowded into the Museum Building on Saturday, 14,000 people visited the indoor displays in the Museum on Sunday, Oct. 26. Many thousands more enjoyed only the border plantings outdoors. In all, 33,855 persons were clocked through the gates during the three days.

Opening Ceremony and Program

John Gambling, who conducts the radio program "Rambling with Gambling" on WOR, was honored in a brief ceremony for the opening of the Chrysanthemum Show at 2 p.m. Friday, by having a new chrysanthemum named for him. Asked to designate his choice from the seedlings exhibited by Vincent de Petris of Grosse Pointe, Mich., he chose a red-and-gold pompon. Presentation of the new flower to Mr. Gambling was made by Ernest L. Bertram of Lancaster, Pa., President of the Society. In his youth, Mr. Gambling had been a commercial grower of chrysanthemums, and he has always been a gardening enthusiast.

A prize-winning flower arrangement with chrysanthemums, designed for a Thanksgiving buffet and executed by Mrs. L. R. Dodson of Larchmont

Alex Laurie, Professor of Floriculture at Ohio State University, gave the principal address at the program which began at 3 p.m. in the lecture hall. Speaking on "Chrysanthemums for the Millions," he described a simple method of propagation, gave brief cultural directions, and presented his opinion of the organic gardening movement and of the craze for introducing earthworms into the garden soil.

At the symposium on outdoor culture of large-flowered chrysanthemum varieties, which followed, James S. Jack, the chairman, was assisted on the stage by Dr. E. L. Scott, founder and past president of the Chrysanthemum Society; Mrs. Scott, co-editor of the society's bulletin; Mrs. John W. Roberts of Mamaroneck; Ernest L. Bertram; Lester W. Kinne, Secretary-Treasurer of the Chry-

santhemum Society; F. F. Rockwell, Editor-in Chief of *Home Garden* magazine; and T. H. Everett.

Tea was served in the Members' Room for members of the two co-operating organizations when the symposium was finished.

Diseases, Pests, and Literature in Exhibits

At the entrance to the Lecture Hall, Dr. P. P. Pirone installed an exhibit on diseases and insect pests of chrysanthemums, and between 2 and 3 p.m. on both Friday and Saturday, he was present to answer individual questions. Mimeographed leaflets were prepared for free distribution, covering chrysanthemum diseases and pests in general and their control, a formula for an all-purpose spray, and specific information on nematodes and their control.

During the first two days of the show, there was an extensive display of chrysanthemum literature, European, Asiatic, and American, in the Garden's library. Publications shown included books, pamphlets, periodicals, and illustrations dating from 1796 to the current year.

Event for Children

An innovation this year was a children's exhibit, staged on Saturday morning in the basement of the Museum Building. Planned in co-operation with the Nature Education department of the New York City Board of Education, it consisted of flower arrangements by 100 New York school children. The Garden provided cut chrysanthemums and other flowers, and awarded prizes to Rachel Anne Mehr, Barbara Salant, Theodore Baker and Joyce Guedalia in the intermediate class and to Betty Joergensen, Judy Orseck, Virginia Kowalk, and Oliver Roberts in the junior class.

In conjunction with this, posters were submitted from two schools, and for these the Garden gave prizes of potted bulbs. Carmen Basile and Frank Vernocchia of

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Paul Hoffman Junior High were first and second prize winners. Arthur Jacobs and David Lock of Junior High 117 received honorable mention.

At the conclusion of the chrysanthemum show, the flowers from the principal exhibits were delivered to two veterans' hospitals.

For the National Chrysanthemum Society, Mrs. H. E. Kincaid of Mamaroneck was general chairman. Working with her on various committees were Mrs. Loren R. Dodson, Mrs. Kenneth L. Stelle, Dr. and Mrs. E. L. Scott, Carl Toepler, Mrs. Clifford B. Curtis, James Stuart, Paul F. Frese, Mrs. Thomas Farmer, James S. Jack, and Fred Shumaker.

Notes, News, and Comment

Board of Managers. Charles B. Harding has been named a vice-president of the New York Botanical Garden to succeed Henry de Forest Baldwin, who died May 18, 1947. Mr. Harding was made a member of the Board of Managers on June 10, 1946. Mr. Harding is senior partner in the banking firm of Smith, Barney & Co.

Sherman Baldwin, of the firm of Lord, Day and Lord, was elected to the Board of Managers in the class of 1949 to succeed his father, Henry de Forest Baldwin. He has been a member of the Corporation of the New York Botanical Garden since 1929.

Oakleigh L. Thorne was made a member of the Board of Managers in the class of 1950 at the meeting held Oct. 15, 1947.

Courses of Study. The largest number of students since before the war is enrolled in the classes being offered at the New York Botanical Garden this fall. There is a record enrollment in Nature Study for Teachers, with 80 students, and in Field Botany, with 36. The class in Fundamentals of Gardening, which is the opening term in the Two-Year Course in Practical Gardening, has 65 students. Systematic Botany is being taught to 37, including 13 employees of the Garden, while the term in General Botany has an enrollment of 29, of which 10 are employees. These two classes are part of the Two-Year Science Course for Gardeners.

Grape Breeding. During September Dr. A. B. Stout spent a week at the New York State Agricultural Experiment Station at Geneva in his research with breeding seedless grapes. Seven seedlings which have seedless berries were in fruit for the first time, bringing the total of such seedlings to 314. A trip was also made to Fredonia, near Lake Erie, for an inspection of test plantings of selections and of the newly named Interlaken Seedless grape, which was described in the Journal of the New York Botanical Garden for April 1947.

Gasteromycetes. A scholarship has been granted to Dr. S. M. Zeller, Plant Pathologist at the Experiment Station at Oregon State College in Corvallis, to work on the Gasteromycetes for *North America Flora.* Dr. Zeller arrived in New York with Mrs. Zeller Oct. 20, and plans to work at the Garden until Feb. 1.

Visitors. Dr. W. J. Lütjeharms, Professor of Botany in University College, Bloemfontein, Orange Free State, was a visitor at the New York Botanical Garden Oct. 15. He is spending six months in

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the United States, working on soil fungi at New Brunswick with Dr. Selman A. Waksman.

Dr. Antonio P. L. Digilio, head of the cryptogamic work at Tucumán University, and associated with the Instituto Lilloa, at Tucumán, Argentina, visited the Garden Oct. 2. He is spending a year at Harvard University.

R. Kent Beattie of Rockville, Md., who was one of the first scientists to work on the Dutch elm disease when it was discovered in America, came to the Garden Oct. 2. The following day, J. C. Van Balen, Director of Parks of Johannesburg, South Africa, was a visitor. Henry Teuscher, Curator of the Montreal Botanical Garden, stopped at the Garden Sept. 30 on his return from the National Arborists' Association meeting in San Francisco. Another recent visitor was Henry Fleming of the New York Zoological Society.

Amazon Mission. Dr. Bassett Maguire was one of two United States delegates to the International Scientific Commission which met at Belém-do-Pará Brazil, Aug. 12-18. He was accompanied by Dr. Remington Kellogg, Curator of Mammalogy, Smithsonian Institution. The Commission was set up under the auspices of Unesco in 1946 with Brazil, Bolivia, Colombia, Ecuador, Peru, Venezuela, France, Great Britain, the Netherlands and the United States collaborating on a plan for the development of the Amazon Basin.

Theater Benefit. Tickets for the performance of "Antony and Cleopatra," starring Katherine Cornell, at the Martin Beck theater Dec. 3 will be sold for the benefit of the New York Botanical Garden. Arrangements for the occasion have been made by the Garden's Manhattan office.

Epimediums. Harold Epstein, author of the article on "Rock Gardening in Westchester" in the October Journal, writes that the illustration used on page 227 shows varieties of two different species of *Epimedium.* At the left is *E. macranthum* var. *niveum,* while the smaller flowers at the right are *E. youngianum* var. *niveum.*

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The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

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A new set of cases in the rotunda of the Museum Building will henceforth house a succession of temporary exhibits.

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Plants appropriate to the holiday season will follow the late autumn display of chrysanthemums.

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Six sessions on alternate Thursdays, 8-9:30 p.m.
Jan. 29—Apr. 8 — Instructor: *Dr. R. A. Howard* — $5

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Cover photograph by Elisabeth Keiper

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Woody Plants Unique and Noteworthy In the Rochester Parks

A Survey and Appraisal of the Work of Bernard H. Slavin

By Elisabeth Keiper

THE parks of Rochester, New York, are widely famed for their great plant collections. Best known of these today is the aggregation of lilacs in Highland Park, a planting which in May each year brings tourists and plant lovers from all sections of the country on a pilgrimage. While these lilacs—400 species and varieties—are the great attraction, there are other assemblages of woody plants which are equally noteworthy, though they are, by their nature, less spectacular. They are part of the long succession of novelties which have been the life blood of the Rochester park system in its horticultural aspects.

Begun in the days when the city was one of the nursery capitals of the world, by virtue of the presence of such renowned firms as Ellwanger & Barry, Chase Brothers, Green's, and Brown Brothers, Rochester's park system has been developed in keeping with a rich tradition. Famed plant hunters, including E. H. Wilson, have made contributions to the diversity of its material, and outstanding arboretums have shared in its building.

The parks thus have come to harbor a treasure of woody plants from Asia, Europe, and the North American continent which are adapted to the climate of northeastern United States. They have not only assembled this material but in turn have enriched the horticultural world with many new and valuable forms of trees and shrubs produced within their acres.

Students of the lilac are aware that a number of fine forms of *Syringa vulgaris*, presented to the world in the 1920s, were developed in Rochester by John Dunbar while he was assistant superintendent of parks. But the

work of his successor, Bernard H. Slavin, in discovering and producing new forms of many other ornamental woody plants is known to only a few horticulturists, and by them, even, not in its entirety. It is time, therefore, that an attempt should be made to correlate and appraise the work of Slavin, who retired five years ago as superintendent of parks. For he was a great American plantsman, who, to the immense good fortune of the Rochester parks and the millions who have enjoyed them, gave more than a half century of devoted service to enlarging the tradition of "The Flower City."

Foremost among Slavin's horticultural contributions to his home city, and other cities as well, is the development of upright trees for street planting. Rochesterians by the thousands daily enjoy street and parkway vistas which are a testament to Slavin's early discernment of the value of these slender forms and to his discovery of several new ones among the favorite trees used on streets in the Northeast.

The major Slavin achievements in this respect are an upright elm, *Ulmus americana ascendens* (1) (2)* and an upright Norway maple, *Acer platanoides erectum* (1) (2), which have been generously propagated and planted along the city streets.

*Figures in parentheses refer to the volumes listed at the end of the article, in which these forms are described.

At the entrance to the Veterans' Memorial Bridge in Rochester, N. Y., erect forms of the Norway maple have been used to avoid obscuring motorists' vision.

Forty-year old upright elms line some of Rochester's streets. These are on Navarre Road.

Conscious of the problem of inducing street trees to grow in a modern city where pavements limit their natural water supply and sooty air menaces healthy growth, Slavin pinned his faith on narrow trees for narrow streets. He also saw them as more suitable for cramped quarters than spreading forms and for the outlining of parkways where the vision of motorists must not be obscured.

Today this faith is justified by a beautiful planting of fastigiate Norway maples on the approaches to Rochester's handsome Veterans' Memorial Bridge over the deep Genesee River gorge. Here, circular drives are rimmed by the slender green spires without interfering with a complicated maze of ever-flowing traffic.

This gift of Slavin to the science of street tree planting in the northeastern United States alone should entitle him to lasting fame. But there is more of the story to be read in the city parks, where may be found, for example, a pink-flowered shadbush, the Katherine crab, a dwarf Mugo pine, and many other unusual items little known to the world, but presenting distinctive offerings for American gardens.

Slavin, who gave his entire career to the Rochester parks with rare dedication, and who had no interest in promotion of personal fame or fortune, would be the last person to think of himself as an originator of plants. His work was that of a park man, to whom fell the happy lot of returning hundreds of barren acres to a state of verdure.

This was a task of magnitude, but it did not daunt him. It called for wholesale propagation of plants in park nurseries, in the course of which nature, with her usual caprices, occasionally presented him an offspring of unusual character. These newcomers were not a goal such as that for which the conscious hybridizer strives, but were a by-product. This fact, however, by no means diminishes their value.

Slavin was too busy to make use of the camel's hair brush of the hybridizer. What he did was collect seeds, often by the bushel, from promising parents, sow the seeds, line out the seedlings in nursery rows and watch for results with a critical eye. Quantity production was the primary aim. There were acres to be replanted and the budget ruled out purchase of nursery materials in the heroic proportions that were needed.

But he was not indifferent to quality, to the chance variation or to something new and better, produced as a natural hybrid. That is why the great plant collections of the Rochester parks are dotted with Slavin-produced originations. Some, like the pink shadbush, *Amelanchier grandiflora rubescens*, have been named and recorded by authorities such as Dr. Alfred Rehder (1). Others, unnamed but no less beautiful and noteworthy, still bear only the label "BHS" with a number, waiting for a latter-day "discoverer" to give them recognition.

Slavin has always been too much engrossed in his job to be concerned with personal renown, and so he has never pushed his own originations to the fore in the plant world. He has been content to cherish, propagate, and plant them and to let the work speak for itself.

After a 52-year career in the Rochester parks, which took him from day laborer to superintendent, Slavin retired in 1942, one of the last of the old-line plantsmen who came up the hard way. He began work in 1888, at the age of 16, with a shovel, earning 15 cents an hour for a 10-hour day in Genesee Valley Park, then new and waiting to be developed. Barney was green, but he was also Irish and tough. He "had to be tough," he later declared, to boss the lumbermen who came in from the woods to work in the parks and over whom he early became foreman.

In his progress up the parks ladder he became successively Highland Park foreman in 1901, Seneca Park foreman in 1905, assistant superin-

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ON THE OPPOSITE PAGE

Among the numerous upright forms of trees that have been discovered by Bernard H. Slavin are a cherry (upper left), an American hornbeam or blue beech (upper right), a Norway maple, such as has been used on Rochester's streets (lower left), and a linden (lower right).

tendent of parks in 1910 under Dunbar, an English-trained Scottish horticulturist of note; then superintendent of parks, succeeding Dunbar in 1926, and holding this position until his retirement.

This, in brief, is the career of the lad who at the age of 7 came to the New World from Ireland with his father, Arthur Slavin. The family landed first in Canada in the vicinity of Petersboro, where the father worked for two years in lumber camps until he had sufficient funds to come to Rochester. Young Barney had only four years of formal schooling, but in his adult life he tutored at home in academic subjects from 1906 to 1915.

As a botanist and horticulturist he is self-taught, but he has the natural endowments which make the keen plantsman—curiosity, imagination, intuition, enthusiasm, and a deep artistic appreciation of the plant world. He also benefited greatly by his apprenticeship in parks work under Dunbar, who had been a gardener on the estate of the Duke of Argyll before coming to America.

But all this might have come to nothing had be not possessed also that quality known as "fighting Irish," which made him respond to obstacles with vigor and determination.

Rochester's parks were not born, but made. Highland Park, with its world famous collection of lilacs, is a monument in large part to the genius of Dunbar. The latest of the city parks to be developed, and the largest, Durand-Eastman Park, on the shores of Lake Ontario, is testimonial mainly to the vision and dogged persistence of Slavin.

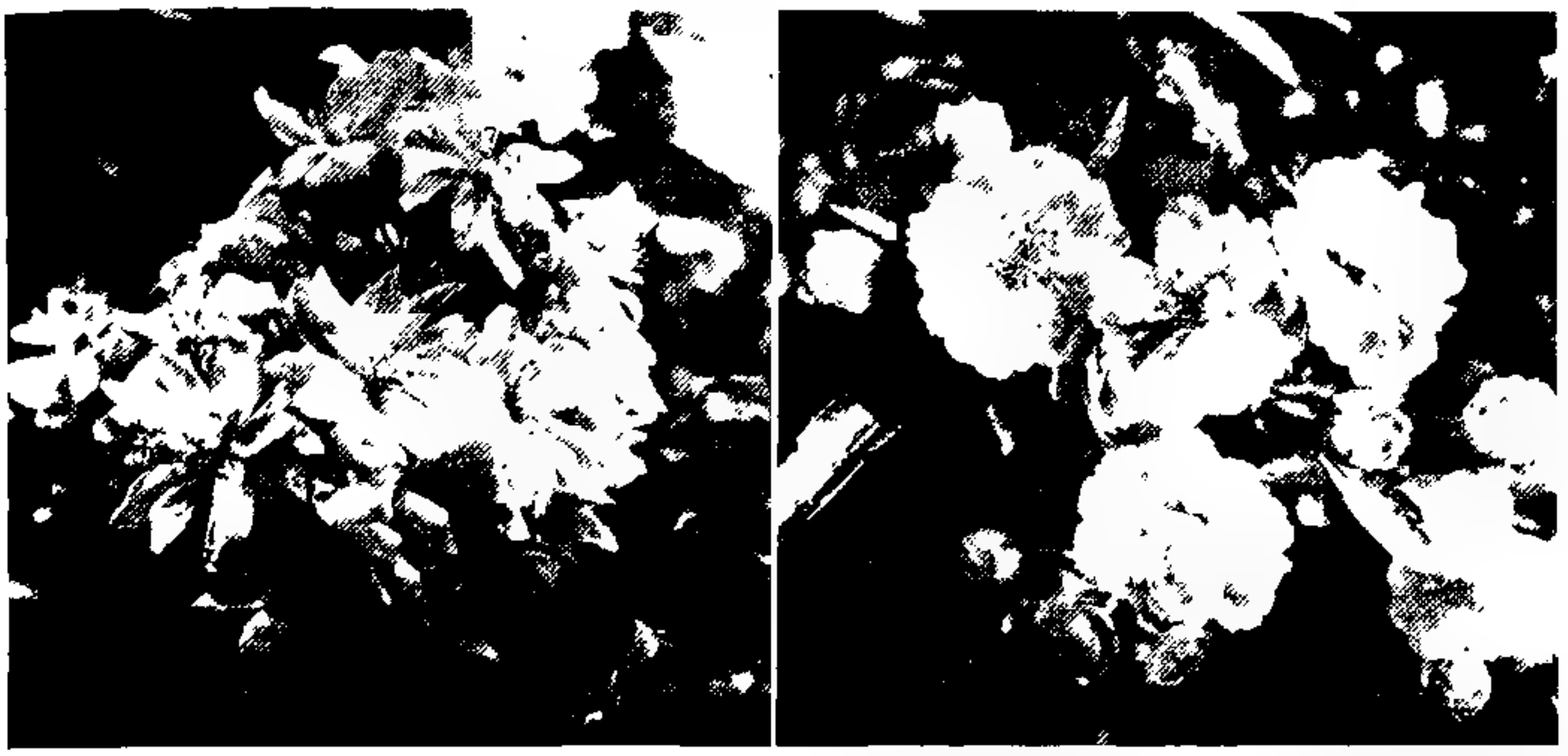
This park came to the city in 1908, a gift of 484 acres, presented by the late Dr. Henry S. Durand and the late George Eastman of Kodak Company fame. Subsequent acquisitions brought its acreage to the present 499.

In 1908, when it was put into the hands of Slavin for development, it included 75 acres of natural woods and the rest "God knows what," in his own words. Abandoned farm lands, weedy fields, steep banks, raw cuts where roads had gone through, became the problem of Barney Slavin.

The new park was a desolate sight. Slavin recalls that a member of the then-functioning Park Commission, composed of civic leaders, viewed the sorry domain with him and remarked:

"I don't know why you bother with it, Barney. You'll never make anything out of it."

Today, Durand-Eastman Park is one of the most beautiful in the nation. Wooded hillsides have been recreated so skilfully that it is almost impossible to determine where the hand of nature stopped and that of Slavin took over. Broad valleys are grass-carpeted for golfers or to serve as home for important plant collections, while providing sweeping vistas. Roadsides are planted naturalistically but selectively with the most suitable of native and exotic materials.



Two of the flowering crabs which have been originated and propagated by Slavin are the Katherine crab (left) and the fringe-petal crab (right).

But, as noted previously, the job was not done over night, nor in a year, by importation of carloads of nursery material. A park landscape man who thought in terms of nursery catalogs would have been defeated by the city fathers and the city budget at the start.

So Slavin thought in terms of seeds, cuttings, and long nursery rows within the parks. The seeds and cuttings came from other Rochester parks, from famed horticultural collections throughout the nation, from China, Tibet, or wherever plant hunters, such as Wilson, foraged for new beauty for the western world.

He "went to school" to such famed propagators as Jackson Dawson of the Arnold Arboretum— a "fine gentleman" and a plant genius, Slavin recalls, adding that "when an Irishman says that of an Englishman it means something."

There were seed flats filling the Slavin home cellar and spilling out into his dooryard, high above the spectacular Genesee River gorge, in Seneca Park. After his day's work in the parks, Slavin spent night hours on his nursery at home. Seeds of woody plants, many of them notoriously hard to germinate, gave him little trouble.

Incidentally, commercial nurserymen, who seldom looked with favor on a city government in the nursery business, had no criticism of Slavin's activities in this field, for it was through him and his park nurseries that many obtained propagating stock of items available only in collections such as those at Rochester. Co-operating both with commercial nurserymen and with other arboretums, Slavin each year distributed quantities of seeds, cuttings, scions and grafts. Some of these distributions even went to other countries. The largest and one of the last of his international distributions

was a 10,000-pound shipment of seeds and small plants to the Royal Botanic Gardens of the British Government at Kew, near London, in 1931.

Two years after the city's acquisition of Durand-Eastman Park the planting there began, though major plantings were not started until 1916. In the meantime, Olmsted Brothers of Boston, landscape architects, had designed the basic road layout; road building was started, artificial lakes were developed, and a nursery was established on a six-acre site to produce stock for the many plantings which were to follow through the years.

As the park development and planting progressed, Slavin protected "impossibly" steep banks and road cuts with wattles of brush and old timbers from demolished farm buildings on the property and somehow persuaded viburnums to grasp a hold in the raw subsoil, eventually taking over the bank-holding work of the planks with their soil-binding roots.

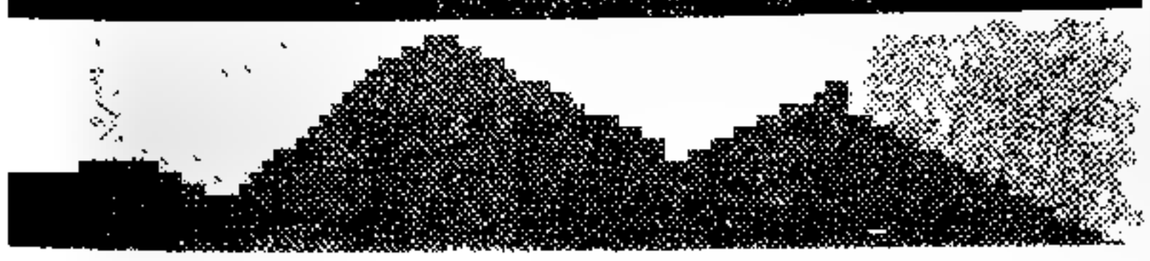
Five lakes, two large and three small, were formed by his damming of marshy lowlands which originally drained into bordering Lake Ontario. Land and water vistas of great beauty were thus created and the sheltered waters provided sanctuary for a substantial wild bird population, which persists today. Water areas were rimmed with a mixture of hardwoods and evergreens to provide a picture constantly changing from the first flowering of spring through the red and gold of autumn.

Slavin's collecting trips in southern New York, Pennsylvania, through the Blue Ridge Mountains and in the Midwest, from southern Minnesota to Texas, made alone and in association with other plant hunters, gave him an opportunity to study the association of plants in the wild. Knowledge thus acquired guided him in recreating the effect of a natural planting in the park even while he subtly emphasized flower and foliage features in a blending of native and exotic material.

These trips also resulted in the collection of many variations in native plants, such as dwarf and thicket shadbushes, and numerous additions to the comprehensive native hawthorn display in the parks.

From 1914 to 1917, commissioned jointly by the Arnold Arboretum and the City of Rochester, he made a survey of the native plums common in the Midwest. During this period he spent about three weeks each spring and fall in that region, collecting specimens in flower and fruit, and his intensive survey of the species resulted in the introduction of much new material.

What contributions Slavin might have made to the horticultural world, had he yielded to tempting invitations to leave the Rochester parks and serve elsewhere, can only be guessed at. There was an offer from the U. S. Department of Agriculture made at the time when he developed a method of grafting peach scions on wild plum stock to protect peach trees against the borer, then causing havoc in the fruit industry. His success with propagating brought bids from other arboretums in the nation. Immediately after World War I, Professor C. S. Sargent tried to persuade him to join the staff of the Arnold Arboretum of Harvard University and



SCENES IN THE PARKS OF ROCHESTER, NEW YORK

Photographs by Elisabeth Keiper

(1) *A large-flowered, late-blooming shadbush on a slope bordering one of the walks in Durand-Eastman Park. This is believed to be a new species, discovered in the wild by Slavin, and as yet undescribed botanically.* (2) *Eastman Lake with a naturalized planting along the shore.* (3) *Durand Lake, where the autumn scene is colorful.* (4) *One of the fringe-petal crabs planted as a specimen tree in Highland Park.* (5) *Numerous types of flowering cherries, in Pine Valley, Durand-Eastman Park.*

to go on a ten-year exploration trip to Australia and the Indonesian countries. In 1922 he almost left Rochester to become director of a large arboretum, but decided against it after he found, as he expressed it, "They had too many blueprints to know what they were going to do."

There were other impressive offers.

He chose, however, to stand by his first and his chief love, the parks of his home city, a community which owes him a debt of gratitude not always wholly recognized.

Co-workers estimate that there are now in the Rochester parks at least 50 species and varieties carried under Slavin numbers which might well be given formal designation and introduced into use. The greater number of these selections are among the magnolias, rhododendrons, azaleas and Chinese lilacs, all of which were the subject of Slavin's constant attention during the last decade of his service with the city of Rochester.

Detailed notes on some of the plants which may be attributed to the work of Slavin are given below. But these by no means represent all of his originations.

A Score of Slavin's Choice Woody Plants

Acer nigrum (upright form). Originated in the park nursery from seed collected by Slavin north of Salamanca, N. Y. In Rochester, only one specimen exists, the original, standing in Highland Park. It is being propagated in another city for test as a street tree because of the ability of the black maple to withstand street conditions well. Its bright yellow autumn coloring is a noteworthy characteristic. This upright form is unnamed.

Acer platanoides erectum (1) (2). Erect form of the Norway maple, discovered by Slavin in Mt. Hope Cemetery, Rochester. It has been extensively propagated and planted in the city's streets.

Amelanchier grandiflora rubescens (1). Seedling of *A. grandiflora* with flowers that are purple-pink in bud, tinged with pink when open. It has been used in a roadside planting in Durand-Eastman Park.

Carpinus caroliniana (upright form). Upright form of the blue beech, or American hornbeam, discovered growing wild in upstate New York. Now, at 22 to 24 years of age, it stands about 25 feet high and 6 feet in diameter. The sole specimen is in Durand-Eastman Park.

Cornus florida (BHS 51). Seedling of *Cornus florida* with shrub-like form, branching from the ground, and compact, dense, round head. The type tree is in Durand-Eastman Park.

Cornus Slavinii (1). Hybrid of *Cornus rugosa* and *C. stolonifera.* A botanical oddity of no particular value in horticultural work, mentioned here because it was the first natural hybrid found by Slavin and named for him by Dr. Alfred Rehder of the Arnold Arboretum. Slavin recognized it as a hybrid while it was still in a seed flat in which he was growing seedlings of *Cornus rugosa.* He grew it to maturity and thus proved his contention that it was a hybrid. This first of Slavin's introductions was discovered in 1907.

Crataegus phaenopyrum fastigiata (1) (2). Discovered among seedlings of the Washington hawthorn. The type tree, columnar, is in Durand-Eastman Park.

Hamamelis mollis (seedling). Selected seedling with distinctive red and

orange color in the flower, called by Slavin *H. mollis superba,* but not formally recorded.

Halesia monticola rosea (1). Pink silverbell found among seedlings and named by Dr. Charles S. Sargent. The type tree in Durand-Eastman Park is distinguished by its pale rose flower.

Magnolia stellata (***BHS*** 85). *M. stellata* seedling with larger flowers than the parent, petals slightly broader and coming into bloom a week earlier. It may be a hybrid of *M. stellata* and *M. Kobus* or *M. soulangeana.*

Malus coronaria Nieuwlandiana (1) (2) (5). This Nieuwland crab is a double pink crab, similar to *M. coronaria Charlottae* but of brighter color.

Malus ioensis fimbriata (1) (5). Fringed petals on this double crab are its outstanding characteristic and give it its name of "fringe-petal crab." It differs from the related form, *Malus ioensis plena* (Bechtel's crab), by this feature and by its shiny spurs. The pink flowers are slightly larger than those of Bechtel's crab and more abundant.

Malus "Katherine" (5). Double-flowered seedling named by Slavin for his daughter-in-law. It is conspicuous among crabs for its regular, somewhat globular shape, with dense branching. Deep pink buds open to blush pink and fade to white. Its heavy flowering makes of it a striking white ball. Blooms are very fragrant. It is being propagated for commercial dissemination.

Malus Sargenti rosea (5). This seedling of *M. Sargenti* is similar to the species in every way except that the flower buds are bright red, opening to deep pink flowers, whereas the species is white.

Pinus Mugo mughus forma Slavinii (3) (4). Dwarf pine forming a low, dense, spreading mat, found among seedlings and named by Murray Hornibrook.

Pinus nigra Hornibrookiana (3). Dwarf, compact plant discovered as a "witches' broom" on an Austrian pine in Seneca Park and named for Murray Hornibrook, who had been helpful to Slavin in the determination of dwarf material in the parks.

Prunus Sargenti (upright form). Originated in Durand-Eastman Park nursery. A single existing specimen of this upright Sargent cherry stands today in that park. Now more than 25 years old, it has a crown but six feet in diameter, although its height is 30 feet. Never formally recorded, it could appropriately be named *Prunus Sargenti fastigiata.*

Pseudotsuga taxifolia pyramidata forma Slavinii (3). Pyramidal form of Douglas fir, selected from a group of seedlings at Cobbs Hill Park. Of denser foliage than the type, it is now, at 33 years of age, only about 22 feet tall and is regarded as a fine ornamental tree.

Robinia Slavinii (1). Hybrid between *R. pseudoacacia* and *R. Kelseyi.* Large shrub with rosy pink flowers, found among a group of seedlings of *R. Kelseyi* and propagated by Slavin at Seneca Park.

Taxus cuspidata minima (1) (3). Extremely dwarf form of Japanese yew, found as a seedling. The type plant at 15 years was 8 inches high and broad.

Tilia americana fastigiata (1). Pyramidal form discovered among seedlings of American linden. Type tree stands in Genesee Valley Park.

Ulmus americana ascendens (1) (2). Upright form of American elm, found growing wild in woods at Seneca Park. It has been propagated and used in Rochester street plantings.

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A Handful of Plant Names And How They Have Come Into Our Language

By H. W. Rickett

(This article has been taken with little change from an informal address on plant names given by Dr. Rickett.)

I NEED scarcely remind you that names are necessary. We couldn't talk without names, perhaps we couldn't think. The unfortunate thing is that often we have too many names. Consider some kinds of *Allium* as examples. One is also known by the following names in languages, ancient and modern, with which any of us may be familiar: cebo, cibol, chibble, czipolle, cebolla, cebula, cipulla, zwiebel, faverel, ui, rödlök, nislauch, oellig, engnin, ingan, innion, ognon, oignon, and onion. The name of another kind, a small onion or "wild garlic" common in Europe, goes back to the time of Theophrastus, who knew it as *Molu*.

Even in one language we are not exempt from confusion in plant names. A familiar little wild flower is known to various persons as innocence, eye-bright, bright eyes, Quaker ladies, Quaker bonnets, Venus' pride, blue-eyed grass, blue-eyed babies, wild forget-me-not, nuns, star of Bethlehem, little washerwomen, and bluets.

On the other hand, sometimes it seems as if we had too few names to go round, for the same name has to be used for obviously different kinds of plants. The bluebells of Scotland (which grow also in England, on the continent of Europe, and in America) are very different from the English bluebells, and neither one much resembles several other plants commonly called bluebells in America. Even within the northeastern United States we find at least half a dozen easily recognized wild flowers called May-flower, otherwise known as spring beauty, trailing arbutus, anemone, hepatica, azalea, and bittercress. Students used to ask me: "But what is the *right* name? What is the *true* Johnny-jump-up?" Who can decide?

If we were to consult a textbook of botany, we might deduce that botanists have solved the problem by inventing names in the dead language Latin. This is encouraging, but quite a false idea. It is true that among botanists and others interested in plants, the good and often expressive and time-honored English names have fallen into some disrepute; while more or less arbitrary and baffling names, often hard to pronounce and harder to remember, are proudly displayed as symbols of erudition. This is really unfortunate. Even our worst enemy scarcely deserves to be called *Taraxacum palustre* variety *vulgare;* and to refer to a lovely flower as

Dimorphotheca aurantiaca suggests some sort of deficiency of the finer feelings. In seed catalogs, the more pretentious the nursery the more elaborate is the nomenclature. I suppose such a breath-taker as *Erigeron speciosus hybridus grandiflorus* is more likely to part us from our dollars than just plain fleabane. Or perhaps when you order *Nierembergia hippomanica coerulea flore-pleno* you are not supposed to know just what you are getting -or getting into.

Actually, names of this sort were not really invented by scientists to mystify or impress the public. They are historical survivals, shaped and sharpened by the scientist—but often, unfortunately, misused and dulled by the horticulturist. To understand their nature and right use it is necessary to look into their ancestry.

Some of the classical Greek plant-names are—with slight changes—immediately familiar: *Krokos, Narkissos, Huakinthos, Lotos, Smilax, Hemerokalles, Iris.*

These were in everyday use twenty-five hundred years and more ago, and were applied much as their descendants are today -though not always for the same plants. To one who knows something of that colorful and imaginative race, they are more than names they are legends. They have associations in myths.

Iris, for example, was the maidservant of Hera, the queen of Olympus; she descended to earth on her many-colored scarf, which, flung across the sky, was visible as the rainbow. It is impossible now to say whether the flower was named for the goddess or the story grew from the flower—perhaps a little of each. *Hyacinthus* was a mortal boy beloved of the god Phoebus and killed by him accidentally while at play; from his blood arose the flower, stained by his ebbing life. Another story has it that it commemorates the suicide of the great king Ajax; the first two letters of whose name are said to be formed by the veins of its petals—and also make the Greek exclamation of mourning; "Ai! (Woe!)." *Narcissus,* the beautiful, pined away by a stream for love of his reflection in the clear water, and became the graceful flower forever leaning from the bank. *Daphne* was a mortal maid devoted to the chaste service of Artemis. Phoebus became enamored of her, but she fled his embraces; when she could run no more from the swift god, she called for help to her father, the river-god Peneus, and became changed into the laurel tree. Phoebus transferred his affection —in part—to the tree, which was a sacred tree and a symbol of victory, especially in musical contests. *Asphodelus* furnished nourishment for the dead. For this reason it was planted by graves, a custom which persisted even into medieval times and beyond—the name becoming perverted into daffodil and being applied to a different plant.

Other names refer to some properties of the plant; they are descriptive. *Adiantum* means "unwetted"—the little maidenhair that droops over the

waterfall and from whose dry leaves the drops of water roll off. Indeed, *Narcissus* is connected with a word meaning torpor—from which we derive also "narcotic"—in reference to the drugging effect of the heavy odor. It is hard to say which came first, the myth or the word. *Geranium* (from the Greek *Geranion*) means like a crane, because of the long bill of the pod.

Still other names were just names, of unknown antiquity and significance. *Lotos* apparently just meant plant.

But these people had much the same troubles with names as we do. One plant might have several different names: what we now know as a kind of cherry was *Kerasos* or *Lakarc*. And still oftener the same name might do duty (like "Mayflower") for several different plants. *Lotos* might be the Egyptian waterlily (a *Nymphaea*), or the African tree of the fabulous lotus-eaters (*Zizyphus*), or a hackberry (*Celtis*), or even a clover (*Trifolium*), besides several other things—none of which we call lotus now.

The names used by the Greeks were taken over, with their civilization. by those great administrators and imitators, the Romans. Their naturalists added little that was new, but made tremendous compilations. Pliny is said to have summarized more than 2,000 books in his great work on natural history. He naturally wrote in Latin, and it was Latin that survived as the language of educated persons, the medium of exchange of ideas, during the "dark ages," the ages of bloodshed and political chaos in Europe. Pliny's names were the names used by medieval scholars when they spoke about plants. Many of them were the Greek names latinized: *Crocus, Hyacinthus, Narcissus*. Sometimes Latin names replaced the Greek ones: *Quercus* for *Drus, Laurus* for *Daphne, Lilium* for *Hemerokalles, Rosa* for *Rhodon, Allium* for *Molu* (*Moly*). The plants names retained their association with fanciful tales and persons—to the Romans, especially. they were in a sense proper names. *Quercus* meant not only a kind of tree but the habitation of a nymph—the Greeks had called her a dryad.

During the prosperous days of the Roman Empire, Greek was used as well as Latin. Dioscorides wrote in Greek on plants, chiefly for those interested in their medicinal properties. Thus the Greek names as well as the Latin were preserved into medieval times, although only Latin was actually in popular use.

Hundreds of years passed in which little attention was given to precision or to art in dealing with plants—or to any of the gentler arts of civilization. We may pass over the dark ages to the time of the great herbalists—Matthioli, Fuchs, Brunfels, Bock, and the rest. We find them still using the names of Pliny and Dioscorides, and attempting to translate them into the tongues of the people. They themselves still spoke and wrote in Latin—it was not an affectation, but was natural to them; it would not have occurred to them to do otherwise. But they also made

efforts to render their knowledge available to the common, uneducated people. So Fuchs rendered *Allium* as Knoblauch. *Hyacinthus* became Gross blaw Mertzenblüm, Klein blaw Mertzenblüm, and Weiss Mertzenblüm—three evidently related varieties of the same kind of plant.

But there was a new problem: Who could be sure that he was using the ancient names for the same plants as those the ancients knew? The Latin and Greek descriptions were often very meager, and rarely were illustrated. As the medieval monks took up the task, they applied the names by conjecture. This procedure was complicated by the fact that many of them lived north of the Alps and never saw the same species that Pliny knew. And, you remember, even the ancients had used one name in various senses. One kind of *Huakinthos* mentioned by Theophrastus was apparently a *Scilla,* another a *Delphinium.* In the "Hortus Sanitatis" of 1485, *Aigilops,* which in Greece was a kind of oak, is obviously a columbine; to Dioscorides it was a grass. *Smilax,* which was a yew to Theophrastus, became some kind of vine, or sometimes a bean. So confusion multiplied confusion, and the learned scholars of the 16th and 17th centuries had a hard time deciding which names belonged to which plants. Indeed, they found it necessary to make up new names, for they had many new kinds of plants. They made up names from Latin roots, such as *Campanula* for a bell-shaped flower.

Notice also that in the early days the number of plants recognized was rather small and each had a name to itself. Even plants which we should lump together as related had often individual names. To Theophrastus the common oak of northern Europe was *Drus,* but the cork oak was *Phellos,* the turkey oak *Phellodrus,* and other oaks *Aigilops, Prinos,* and *Smilax.* It is as if we spoke of sugar-tree, silver-leaf, red-leaf-in-spring, and striped-twig, without ever realizing that they could all be lumped under the name "maple." There were some exceptions—the two kinds of *Hyacinthus* noted above, and the three kinds of *Daphne,* one of which was a *Laurus*; another, oleander; and the third, the Alexandrian daphne, a *Ruscus.* Curiously, these groupings took in *un*related plants—just as we use the word hemlock for quite unrelated plants,—an evergreen tree and a poisonous herb.

Now when the herbalists attempted to deal with the much greater number of plants that was becoming known to them, they began usually with the old names and attempted to add qualifying words to distinguish the kinds. As we say "sugar maple," "red maple," and the like, so Bauhin in 1671—writing of course in Latin—said "Solanum scandens," "Solanum quadrifolium bacciferum," "Solanum tuberosum esculentum." As the species multiplied, the words necessary to distinguish them also multiplied, and the names grew pretty complex: "Solanum pomiferum fructu rotundo striato molli."

Remember that these men were writing in an inflected language. The endings of the words change to indicate their meanings. "Fructus" is fruit, "fructu" is *with* fruit. The names had a gender—masculine, feminine, or neuter; and the adjectives had to conform. In general, trees were apt to be thought of as female, other plants often as male or neuter (*Narcissus, Allium*). Usually the gender was indicated by the termination. *Rosa* is feminine, so white rose must be *Rosa alba,* not "Rosa albus." But this is not always true—trees, you remember, are generally feminine. So it is *Quercus alba,* not "Quercus albus." An hour or two expended on the rudiments of Latin grammar will make the apparently baffling names even of medieval herbalists take on some semblance of sense. These men were not inventing a system, not devising a "scientific terminology"—they were just trying to write precise descriptive phrases in the language that was most natural to them.

By the eighteenth century, travelers were bringing back ever increasing multitudes of new species—dried specimens and living plants. It was not hard for the experts to name them in the way I have described. It was very hard to master the names thus created. The more species under one name, the greater the number of words required to name each one. Our *Huakinthos* becomes, in Linnaeus' hands, "Scilla radice solida, corymbo conferto hemisphaerico" to distinguish it from another kind which was "Scilla radice solida, floribus erectiusculis paucioribus." You can imagine what it took to name a lily: "Lilium foliis verticillatis, floribus reflexis, corollis campanulatis." Furthermore, every new author would revamp the names to his taste. The lily just mentioned was the "Lilium angustifolium, flore flavo maculis nigris distincto" of Tournefort and the "Lilium Martagon canadense maculatum" of Morison, or so Linnaeus thought. It is a far cry from Theophrastus' simple *Hemerokalles* and *Krinon*—both of which names Linnaeus put to other uses.

Linnaeus named about 6,000 species—a lot of plants for any system of nomenclature. He realized that these names were troublesome, so he made a very significant invention: what he called the "trivial" name. In the margin, at one side of the long string of words which was the name of a plant, he wrote a *single adjective*. This word was used only once in that genus, and became, when tacked onto the genus-name, a sort of label. You could simply say *"Scilla bifolia"* or *"Lilium canadense"* and others would know what you were talking about, although you had not really named the plant in any intelligible way. For the first time since the beginnings of this history we are relieved of the necessity for trying to *characterize* the plant we wish to mention—we need only *name* it. This is the famous binomial system.

It certainly met the need. Botanists at once found themselves able to cope with the avalanche of plants which descended upon Europe from all

parts of the world. The system is as useful today as when Linnaeus invented it. It is true that botanists still have their troubles, for it is inevitable that one plant, by accident, gets more than one binomial. But we can settle that difficulty by the arbitrary rule that only the first one will hold. It has been found necessary also to divide up species into varieties and races, named with trinomials and even quadrinomials. These are harder to use, but they are systematic and they are not subject to the fancy of every author, as their predecessors were, except in seed catalogues. The Linnaean binomial names have become nearly standard the whole world over. And they need not interfere with vernacular use of familiar names.

So from the *Molu* of Theophrastus in the fourth century, B.C. we pass to *Allium dioscoridis,* to *Allium moly,* to *Allium magicum,* to *Moly latifolium liliflorum,* to lily leek, to knoblauch and ail doré, and finally—if you read your Milton—you will find the word entering the language again as plain "moly" for ordinary purposes.

NOTICES AND REVIEWS OF RECENT BOOKS

Weberbauer's Vegetation Of the Peruvian Andes

EL MUNDO VEGETAL DE LOS ANDES PERUANOS. Estudio fito geográfico. A. Weberbauer. 776 pages, map in pocket 43 plates; 63 text figures. Ministerio de Agricultura. Lima, Peru. 1945 $12.26.

August Weberbauer long ago distinguished himself as a mentor of the students of the Peruvian flora. Born in Breslau, Germany, November 26, 1871, he studied at the universities of Breslau, Heidelberg and Berlin (Doctor, 1894). He was induced to undertake the botanical exploration of Peru while preparing his lectures in plant geography at the University of Breslau, where he became assistant in systematic botany in 1894 and Privatdocent in 1898.

Granted a leave of four years with pay by the Royal Prussian Ministry of Culture and Public Instruction, and assistance from the Royal Prussian Academy of Sciences, Weberbauer arrived in Peru on November 11, 1901. He immediately began an intensive exploration of the country, collecting 5,200 numbers of plants before returning to Germany in 1905.

Though his work on the study, collecting and mapping of the vegetation of Peru was interrupted by an eighteen months' appointment with the German Colonial Service in West Africa, and later by an administrative position of nearly three years with the Wolfram Mining Company at Pasto Bueno, Province of Pallasca, Weberbauer continued his botanical activities for a near half-century. Though at times he was without an official position or a certain source of income and used his meager savings to further his botanical explorations of the country, he has been associated with the University of San Marcos at Lima intermittently since 1920, and many foreign visiting botanists have appreciated the assistance he has generously offered them there.

August Weberbauer published his "Die Pflanzenwelt der peruanischen Anden" in 1911, constituting volume twelve of Engler's *Vegetation der Erde*. The present work is described on the title page as a 'new, revised and enlarged' edition, yet it is such a substantial recasting that it is unfair in a sense to refer to this first Spanish edition simply as a new edition of the work in German. That the original author has lived to complete this new edition in another language is happy fortune. An unillustrated synoptical account of 67 pages on this subject in English was contributed by Weberbauer to Macbride's "Flora of Peru" in 1936.

His map of the vegetation of the Peruvian Andes was published in Petermanns Geographische Mitteilungen in 1922, followed the next year by a Spanish edition published in Lima.

The present volume is a major event in South American botany. For its authoritative bases, thoroughness, composition, and accomplished scholarship, it is a contribution of the first importance. Published under the auspices of the Ministry of Agriculture, Weberbauer's work is a masterly printed book of 776 pages (German edition had 355 pages), 43 plates (3 more than the German edition), and a new map of his botanical explorations—the two vegetation maps of the earlier edition have not been reproduced. The full page photographic plates reproduced here from the 1911 edition have not appreciably lost their sharp detail and are tipped in at appropriate points throughout the text. Some of the line drawings show signs of wear on the typebed but, nevertheless, they admirably illustrate the text. There is a full index of plant names but the personal names referred to in the history of botanical exploration cannot be found apart from searching the running account. The bibliography dealing with Peruvian vegetation, numbering 172 items in the original German edition, has been brought up to date by the addition of 514 titles.

Geobotanically the work belongs to the descriptive physiognomic school of plant ecologists. In this Weberbauer is in the tradition of Drude, rather than that of Schimper, who wrote of plant geography "upon a physiological basis." Geobotanically the present edition introduces no innovations over the former. The treatment of vegetation types has been rearranged, however, additional subdivisions often added or former sections amplified, all to the greater usefulness of the work. Moreover, the many enumerations of species characteristic of various regions have been emended. Thus "Luzula sp. (Nr. 3072)" of the 1911 edition appears in 1945 as "Luzula racemosa." Plant geographers may well follow this practice when publishing on very incompletely known localities, affording precision for the present though the complete story cannot be told at the time.

Economic plants happily come in for a rather more full discussion thirty-four years after the first account. A few points that arise from a perusal of the present thirteen-page synopsis may be mentioned. Two cereal domesticates brought in for the first time are *Chenopodium canihua*, "cañahua," and *Amaranthus caudatus*, known as "coimi," "quihuicha," etc., in different parts of Peru. Weberbauer rightly questions the correctness of referring the cultivated indigenous strawberry to *Fragaria chilensis*. "Gramalote" or Para grass ("Panicum barbinode," but more properly *Panicum purpurascens*) is noted as a forage grass for warmer areas. The Peruvian "pepino," formerly referred to *Solanum variegatum*, is now called *Solanum muricatum*. Is it the same species as the delicious PEPINO I enjoyed in southern Colombia?

Addendum: For a photograph of Weberbauer see T. H. Goodspeed, *Plant Hunters in the Andes*, opp. p. 96, 1941. This plate was not reproduced in the Buenos Aires' imprint, entitled "Cazadores de Plantas en los Andes" (1944).

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Bananas in the New World Tropics

EMPIRE IN GREEN AND GOLD. Charles Morrow Wilson. 303 pages, illustrated, indexed. Henry Holt & Co., N. Y., 1947. $3.50.

A history of the commercial banana trade from the 1870's to the present is, from the turn of the century, essentially that of the United Fruit Company.

While Mr. Wilson's book on the American banana trade is undoubtedly the result of painstaking research, it would have been vastly more interesting if, instead of giving a factual history of the number of bunches delivered in each

port and of the additions to the Great White Fleet, he had expanded his treatment of the conflict and co-operation between the personalities involved. And if he had given a fuller treatment of company activities in the banana countries and less to those on the mainland of the United States, the book would mean more to the general reader—as the author is at his best when he deals with the various aspects of banana production.

However, I realize that much of the material I have criticized has been included for a complete and adequate coverage of the topic. It does not detract from the especially vivid and well written parts dealing with life in the tropics and the hardships (especially Minor Keith's heroic attempts at building a railroad in Costa Rica) that were encountered in establishing the banana empire.

Having just paid 20 cents a pound for bananas, I wish that the pronouncement of one of the founders of United Fruit, Andrew Preston, that "bananas should remain cheap food for poor people" had prevailed.

MONROE BIRDSEY.

For Christmas

THE GARDEN CALENDAR. Helen Van Pelt Wilson. Illustrated. M. Barrows & Co., Inc., New York, 1947. $1

MAKE YOUR OWN MERRY CHRISTMAS. Anne Wertsner. 112 pages, illustrated, indexed. M. Barrows & Co., Inc.. New York, 1946. $2.

Each year's end brings its supply of small books which make practical and attractive gifts for garden-minded friends.

"The Garden Calendar" for 1948, compiled by Helen Van Pelt Wilson, contains more than half a hundred pleasant photographs, a suitable quotation for each week of the year, and abundant space for engagements and for garden notes.

Last year's small book from the same publisher, "Make Your Own Merry Christmas," done by the Field Secretary of the Pennsylvania Horticultural Society, is filled with bright ideas for doing things at home, particularly with greens and fruits, to enhance the holiday spirit and scene.

CAROL H. WOODWARD.

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BEGONIAS FOR AMERICAN HOMES AND GARDENS. Helen K. Krauss. 228 pages, illustrated, indexed. Macmillan, New York, 1947. $4.

This is a comprehensive work, useful to both professional and amateur begonia enthusiasts.

Mrs. Krauss has filled a long felt need for a concise guide to the identification of begonias. She has spent many years studying, comparing names and varieties, giving to us the best guide to nomenclature yet published. Her book includes descriptions of more than 900 varieties, and is delightfully illustrated. Particularly useful are the charts tracing the history of the different begonia classes.

Also included is an informative chapter, of special interest to the home gardener, on culture, giving detailed instructions on soil, propagation, hybridization, and insect control, with illustrations showing the methods, step-by-step.

JOY L. LOGEE.
Danielson, Conn.

Intelligent Gardening

THE LAZY GARDENER. William C. Pryor. 221 pages, illustrated. Longmans, Green, New York, 1947. $3.

Someone has said that the lazy people are the only ones who contribute to human progress. They are the ones who figure out easier and better ways of accomplishing things. Used in this way, the label of laziness implies intelligence rather than indolence, and on this basis William C. Pryor may properly describe himself as a lazy gardener.

Certainly he has learned to contemplate the useful shortcuts he follows and the unnecessary chores he doesn't do, instead of focusing his attention on the good honest toil that all successful gardening requires, even in this day of rototillers, DDT and 2, 4-D. But after all, it is this frame of mind that holds the key to contentment in gardening or any other activity -when a hobby becomes tedious or nerve-wracking it is because we are riding it too hard.

Surely Pryor has extracted a full measure of satisfaction from his gardening, and his interesting presentation, coupled with Jessie Robinson's entertaining drawings, should tempt even the most confirmed devotee of the armchair to taste the delights of working with plants. By alternating his subject-matter chapters with comments on the events that each month brings to pass in the garden, he succeeds in covering a wide range of topics in remarkably little space.

Pryor's explanations and descriptions have the clarity which marks the approach of one who has not lived over-long with his subject, but the complete novice will wish that some of them could have been supplemented with simple drawings.

VAN WIE INGHAM,
Rutgers University.

Christmas Seals

. . . Your Protection Against Tuberculosis

Far Western Horticulture

YOUR CALIFORNIA GARDEN AND MINE. Sydney B. Mitchell. 261 pages, illustrated, indexed. M. Barrows & Co., Inc., New York, 1947. $3.

The initial appeal of this book will be for the amateur gardener, although professionals could also find in it reliable reference to plant material, nomenclature, and reputable nursery firms.

Dr. Mitchell's chief emphasis is on flowering trees and shrubs, both deciduous and evergreen, and on perennials, stressing the desirability of planting material that will flourish most happily in its native environment. Specific California natives which Dr. Mitchell champions include the genus *Ceanothus,* especially *C. arboreus,* the Catalina ceanothus, one of the earliest of the flowering shrubs, and *C. impressus,*

the Santa Barbara species; *Fremontia californica* var. *mexicana*; *Carpenteria californica*, a neat five-foot shrub with white flowers resembling syringa; *Ribes speciosum*, the fuchsia-flowered gooseberry; and *Dendromecon rigida*, the tree poppy with gray-green leaves and canary-yellow flowers. Particular emphasis is placed also on the deciduous magnolias, too little used in western gardens, and on *Prunus campanulata* and *P. yedoensis*.

"Perennials in Particular" is a chapter that makes superb browsing ground for the amateur, and the chapter on irises is patently written from the heart with contagious enthusiasm. French, Dutch, Siberian, Spanish and California types of iris are well covered, the author yielding many a picturesque note and valuable pointer on their cultivation.

Part of the charm of Dr. Mitchell's writing is in his ready admission of error in his gardening career, but he has made of his errors stepping stones of experiences and now speaks with deserved authority. A long-standing editorship of the Journal of the California Horticultural Society gives Dr. Mitchell the background of a readable and reliable author.

RONALD B. TOWNSEND,
Superintendent,
Huntington Botanical Gardens.

For Biochemists and Others

ADVANCES IN ENZYMOLOGY. Vol. 7. Edited by F. F. Nord. 665 pages, indexed. Interscience Publishers, New York. 1947. $8.50.

Nine of the twelve reviews in this, the latest and largest volume of the series, have interest for plant physiologists and biochemists. The following are of general interest and relate specifically to plant material: Permeability and Enzyme Reactions by S. C. Brooks; Bacterial Luminescence by Frank H. Johnson; Distribution, Structure and Properties of the Tetrapyrroles by S. Granick and H. Gilder; Interrelations in Microorganisms Between Growth and the Metabolism of Vitamin-like Substances by Henry McIlwain; Antibacterial Substances from Fungi and Green Plants by Frederick Kavanagh; and Recent Progress in Industrial Fermentation by F. M. Hildebrandt. We know certain of the magnesium tetrapyrroles as the chlorophylls.

F. W. KAVANAGH

Notes, News, and Comment

Associate Curators. Beginning Nov 1, two Assistant Curators on the Garden's scientific staff became Associate Curators.

Dr. Frederick W. Kavanagh is now Associate Curator of Laboratories, and Dr. E. E. Naylor is assuming charge of the Garden's educational work.

Dr. Kavanagh came to the Garden from the University of Missouri with Dr. William J. Robbins Feb. 1, 1938. As Technical Assistant in Dr. Robbins' laboratory, he carried on research on vitamins and plant growth. In the fall of 1942 he left to teach at the University of Rochester. The following year he spent with the Squibb Research Institute at New Brunswick, N. J. Returning to the Garden in 1944, he was made Assistant Curator in January 1946. His recent research has been chiefly concerned with antibiotic substances from Basidiomycetes.

Coming also from Missouri, Dr. Naylor joined the staff in October 1942 as Technical Assistant in Dr. Robbins' laboratory. The following year he began to take over certain phases of edu-

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cation, and on Oct. 1 he was made Assistant Curator. He has since been given charge of museum exhibits. Since September 1944 he has directed a course in Nature Study for Teachers, in cooperation with the Board of Education, with increasing enrollments every term. He has also taught classes at the Garden in Botany for Beginners, Plant Propagation, and General Botany. During 1945 he did extensive work on the Garden's sound and color film, "The Gift of Green."

Antibiotic Research. Under the title of "Fungi Against Bacteria," the antibiotic research carried on in the laboratories of Dr. William J. Robbins at the New York Botanical Garden is the subject of a five-page illustrated feature in the October number of *Science Illustrated* magazine. The pictures show stages in the search for substances among the Basidiomycetes which will be effective against disease-producing bacteria.

Mexican Travels. The first number of Volume II of *Chronica Botanica,* issued in the summer of 1947, contains Dr. H. W. Rickett's report of "The Royal Botanical Expedition to New Spain." This is the translation and collation of material he gathered from documents in the General Archives of Mexico when he was there on a cultural mission arranged by the Coordinator of Inter-American Affairs in 1944. It records the historic journeyings of Martin de Sessé and José Mociño and their colleagues in the New World between 1788 and 1820. The work, in 86 pages, is illustrated with old prints, copies of old documents, and with the author's own drawings, maps and photographs. One of the appendices contains a list of plants introduced into the Royal Botanical Garden of Mexico around the end of the 18th century. A review of the work will be published in this Journal.

Flower Show. The New York Botanical Garden exhibited 32 kinds of wild flowers and fruits at the annual flower show of the Garden Club of New Jersey at Upper Montclair Oct. 2 and 3.

Mycologia. Dr. Donald P. Rogers becomes Managing Editor of *Mycologia*, beginning Jan. 1, succeeding Dr. F. J. Seaver, who has been in charge of the magazine since 1924, and associated with it since its beginning in 1909.

Horticultural Council. The keynote address on the opening day of the Second National Horticultural Congress of the American Horticultural Council, Inc., meeting in Cleveland, Oct. 23-25, was given by Dr. William J. Robbins, whose topic was "The Place of Horticulture in the Life of the Nation."

The banquet address the evening of Oct. 24 was given by Dr. W. H. Camp, who spoke on "Plant Exploration in its Relation to Modern Horticulture."

Officers of the Council, which is promoting "United Horticulture," are Robert Pyle, President; E. L. D. Seymour, Vice-President; Dr. R. C. Allen, Secretary; and John Nash Ott, Jr., Treasurer.

Michigan Lectures. Dr. W. H. Camp presented three lectures on technical aspects of botany in Michigan at the end of October. At the University in Ann Arbor on Oct. 28 he spoke on "The Origin and Dispersal of Plants." The following day, at Michigan State College in East Lansing, he talked on "The Dynamics of Natural Populations as Viewed by the Taxonomist." Returning to Ann Arbor Oct. 30, he led a discussion group, open only to graduate students in botany, built around the topic of the possible relation of continental displacement to the distribution of modern and fossil plants. He also gave a lecture there on "Complex Species—Their Causes and Compositions."

Groups. Previous to the November Members' Day Program, 35 members of the Philadelphia Garden Club lunched at the Garden, heard an address by Dr. William J. Robbins on his summer's trip to Japan, and were shown through the conservatories and chrysanthemum borders by Dr. R. A. Howard and G. L. Wittrock.

Among other groups which have made special tours through the Garden in recent weeks have been 50 students from Benjamin Franklin High School, 20 from the Science Department of Christopher Columbus High School in the Bronx, who were introduced to the work carried on in the physiological laboratories, and classes from Public Schools Nos. 4 and 46. Members of the Riverdale Garden Club, an Affiliate of the Botanical Garden, had tea in the Members' Room Sept. 20 after a tour of the outdoor plantings.

Lectures. Dr. R. A. Howard took part in the series of lectures on fundamentals of systematics at the Philadelphia Academy of Natural Sciences Oct. 18, speaking on the evaluation of morphological characters in establishing the higher categories of plants.

The Dwight School, Englewood, N. J., and the Woman's Club of Ridgewood, N. J., heard Dr. Howard speak on "Santo Domingo, Birthplace of America" at two lectures early in October.

E. J. Alexander talked before the Peekskill Garden Club Oct. 7, on "Gardening with Wild Flowers."

Dr. E. E. Naylor showed the Garden's two short films, "Plants and the Life of Man" and "The Gift of Green" at the Torrey Botanical Club meeting at Hunter College Nov. 15.

Dr. W. H. Camp addressed the Larchmont Garden Club, an Affiliate of the Botanical Garden, Nov. 3 on "American Plants for American Gardens."

"Plants of the Bible" was the subject of Dr. H. N. Moldenke in a lecture before the Society of the Daughters of Holland Dames Nov. 11. On Oct. 15 he talked on "Marvels in Adaptation Among our Local Plants" before the Summit, N. J., Nature Club.

Bessa Paintings. The 400 floral paintings, done with water colors on lambskin parchment by Pancrace Bessa in the early part of the 19th century, which were exhibited at the New York Botanical Garden in the autumn of 1946, were placed on auction in Beverly Hills, Calif., Nov. 17 and 18. The paintings were brought to North America by Mrs. Flora de Campos-Porto Castaño Ferreira, daughter of the owner of this renowned collection, Paulo de Campos-Porto, former director of the Botanical Garden at Rio de Janeiro, and by her cousin, Rodrigo Claudio de Campos Goulart. After the introductory exhibit of a selection of 150 of the paintings, opening with the Members' Day Program of October 6, 1946,

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at the New York Botanical Garden, they were exhibited in several other museums in the country. This unique collection, which is remarkably complete, represents the originals which were made for the French botanical publication "L'Herbier Général De L'Amateur" between 1810 and 1826.

Medical Mycology. At the two-day conference on Medical Mycology arranged by the New York Academy of Sciences, Dr. William J. Robbins addressed the group Nov. 3 on "The Growth Requirements of the Dermatophytes."

Mrs. John Sloane. The death of Mrs. John Sloane of New York City, a member of the Advisory Council of the Garden, occurred last August. Elected to the group only five months previously, she was to have been made a member of the Corporation at the annual meeting next January. The series of invitation lectures sponsored by the Garden's Manhattan office in January and February, 1946, took place at the home of Mrs. Sloane.

Princeton Conference. Dr. William J. Robbins attended a meeting of the Advisory Council of the Department of Biology at Princeton University Nov. 8.

Francis E. Lloyd. In Carmel, Calif., on Oct. 17, occurred the death of Professor Francis E. Lloyd, who had been head of the Botany Department at McGill University in Montreal from 1912 until he retired in 1934. During the first five years of the century, while he was Professor of Biology at Columbia University, he was closely associated with the New York Botanical Garden, exploring, directing research studies, lecturing, and contributing to the Journal. In August 1900, with Professor S. M. Tracy of Biloxi, Miss., he explored the delta of the Mississippi under the Garden's auspices. His subsequent studies included the plankton of the mouth of the river. In 1903 he collected plants on Dominica for the Garden.

His private herbarium of plants collected on the Pacific slope and in eastern North America was one of the first groups to be incorporated into the Herbarium of the New York Botanical Garden in 1900.

Dr. Lloyd was an authority on the insectivorous plants, and author of a comprehensive book on the subject published in 1942 by Chronica Botanica Company. Spending several years in the southwestern states before going to McGill, he was one of the earliest experimenters in the United States with guayule as a source of rubber.

Director. Dr. E. E. Naylor has been elected to the list of directors of the School Garden Association of New York, succeeding Dr. A. B. Stout.

N.A.G. Officers. The new president of the National Association of Gardeners is James S. Jack, Superintendent of "Brookside," the estate of Mrs. Flagler Matthews at Rye, N. Y. Mr. Jack has long been active in affairs at the New York Botanical Garden, teaching several of the gardening classes and taking a prominent part in arrangements for the annual chrysanthemum show and program. Vice-president is Joseph W. Tansey, Superintendent of "Uplands," the W.A.M. Burden estate at Mt. Kisco. Mr. Tansey was formerly greenhouse foreman and chief assistant to the horticulturist at the New York Botanical Garden, and also an instructor in the Garden's educational program.

Lily Society. One of the directors elected at the organization meeting of the North American Lily Society in Boston July 9 is Mrs. Mortimer J. Fox of Peekskill, a member of the Garden's Corporation and Advisory Council. Another is Mrs. J. Norman Henry of Gladwyn, Pa., an annual member of the New York Botanical Garden. The president is Dr. L. H. MacDaniels of Cornell University.

Garden Club Programs. Through a lecture program sponsored by the Garden's Manhattan office, more than a dozen programs have been given for garden clubs in the East since the middle of the summer. The Garden's two short color films, "The Gift of Green" and "Plants and the Life of Man," also the full-length picture showing year-round scenes and activities at the Garden, have been shown, and a lecture illustrated with kodachromes of Dr. Bassett Maguire's 1944 trip to Surinam has been given by Mrs. Edward Jerome, who has charge of these programs. Clubs in Massachusetts, Pennsylvania, New Jersey, Connecticut, and New York have taken advantage of this service.

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1947

Many of the references in the monthly Notes, News, and Comment are not indexed here. All botanical names of plants are included; the common names only when an entire article or major portion of an article is devoted to the one subject. Asterisks indicate illustrations. Books reviewed are indexed alphabetically by author's name in a separate list commencing on page 299. The year's Table of Contents will be found on the pages preceding 269.

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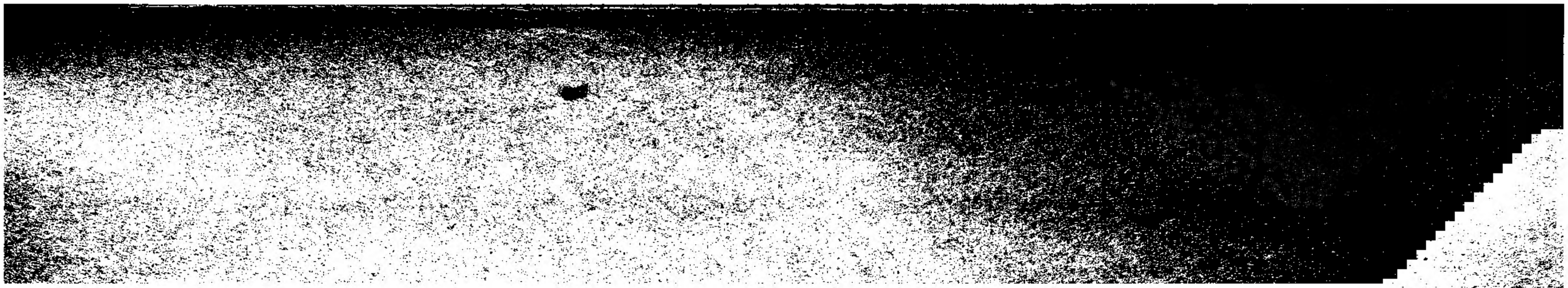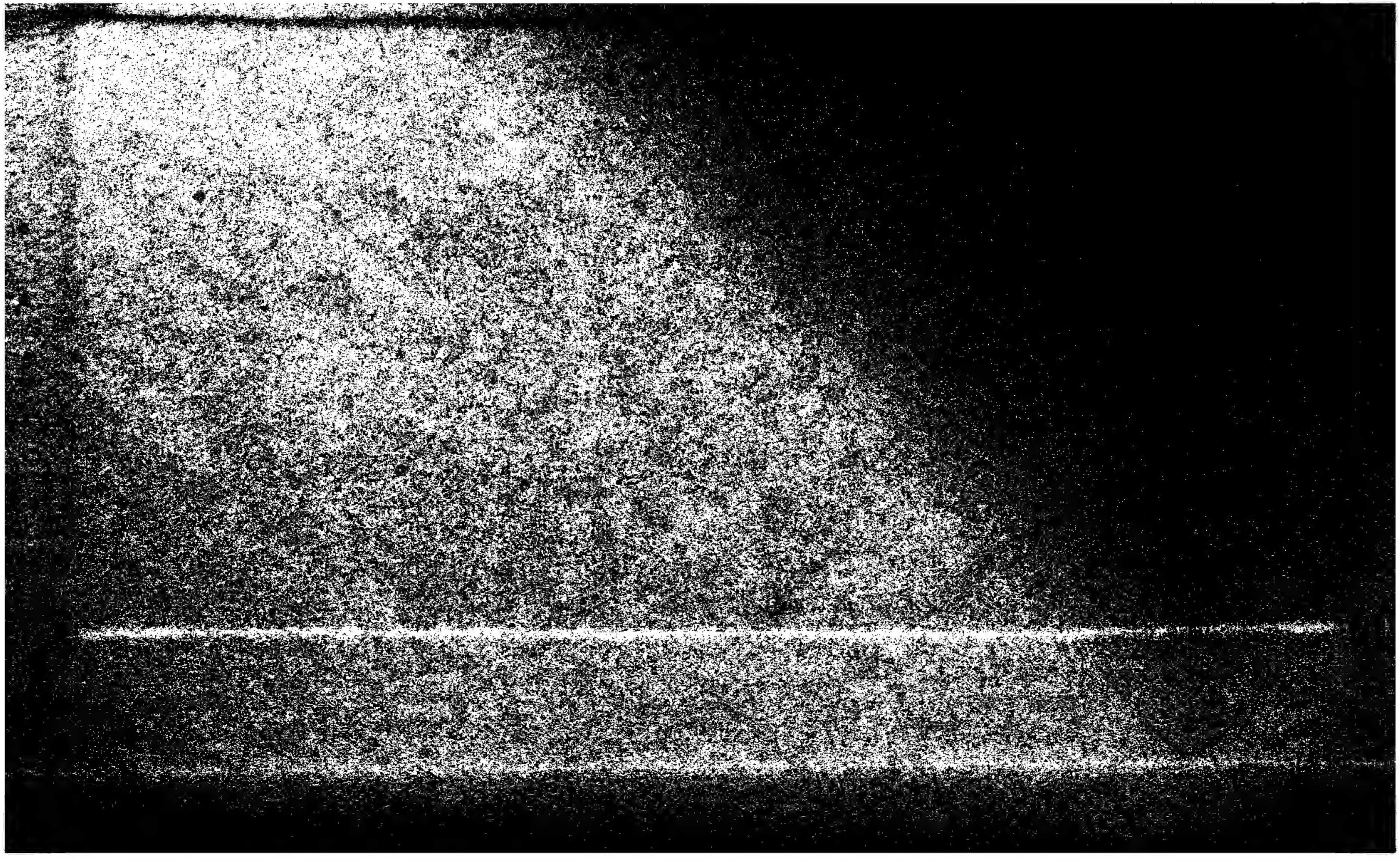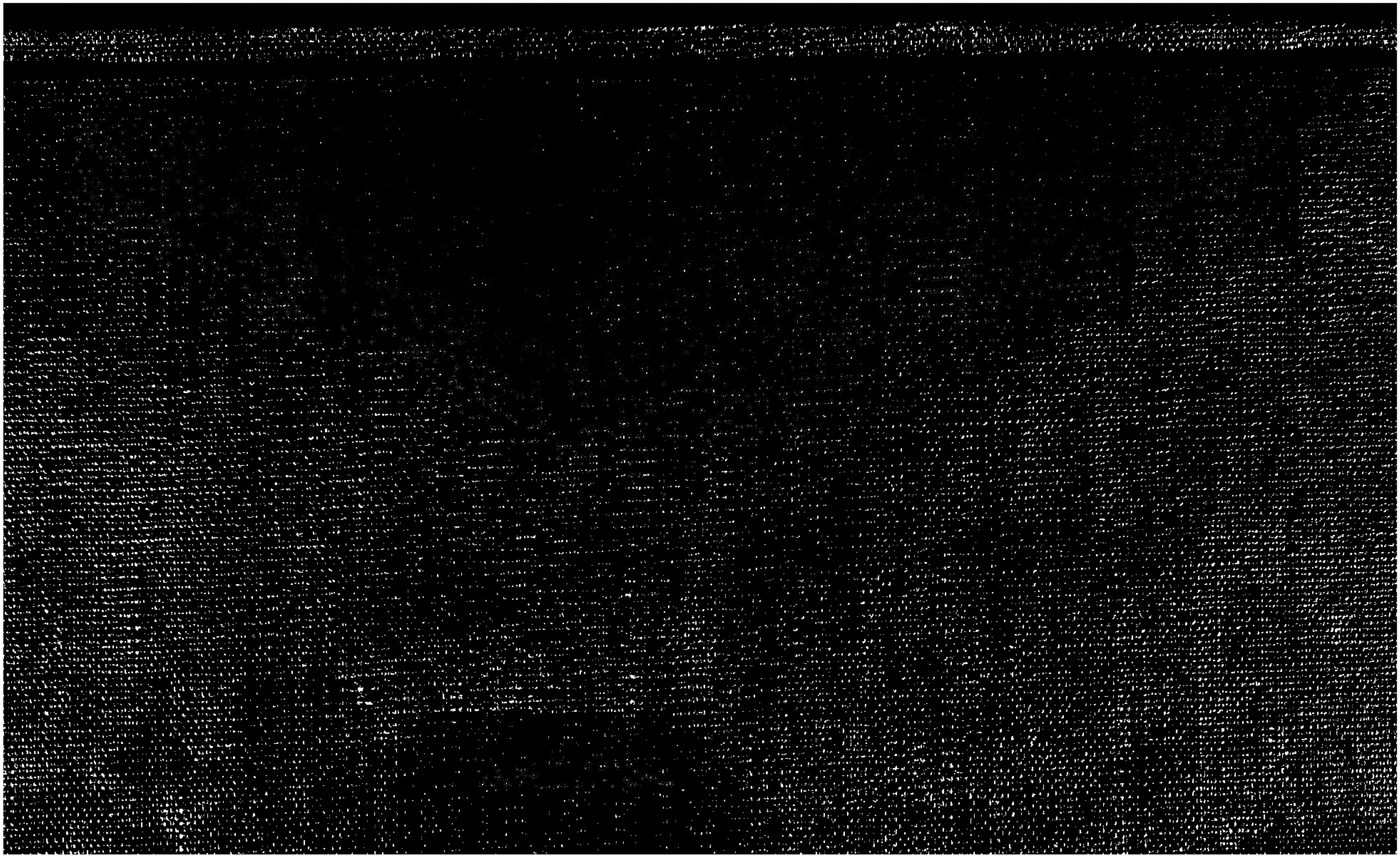
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